SCHOOLEY CALDWELL

ARCHITECTURE. INSPIRED.

DATE: 02/14/2025

JOB #: 23070.00

PROJECT MANUAL

Construction Documents

BICENTENNIAL BARN AT MCCAMMON CREEK PARK

6844 Bale Kenyon Road
Lewis Center, Ohio 43035

PREPARED FOR:

Preservation Parks of Delaware County

300 Marconi Boulevard
Columbus, Ohio 43215

T 614 628.0300
F 614 628.0311

schooleycaldwell.com

BICENTENNIAL BARN AT MCCAMMON CREEK PARK

6844 Bale Kenyon Road
Lewis Center, Ohio 43035

PREPARED FOR:

Preservation Parks of Delaware County

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Lewis Center, OH 43035

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INVITATION TO BID

Sealed bids for the construction of the Bicentennial Barn- McCammon Creek Park Project will be received by Preservation Parks of Delaware County, 2656 Hogback Road, Sunbury, Ohio, 43074, until **3:00 PM local time on March 13, 2025**, and immediately following the deadline the bids will be opened and publicly read.

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

In accordance with the drawings and specifications prepared by Schooley Caldwell, Architects/ /Planners/Interior Designers, 300 Marconi Boulevard, Suite 100, Columbus, Ohio 43215-2325; telephone (614) 628-0300.

The Project is expected to start in May 2025, and substantial completion will be twelve months from the Notice to Proceed.

Proposals will be received on a Lump Sum, Contract Bid for the Work.

Each Bid shall be accompanied by the following documentation. Failure to submit any part of this document shall represent just cause for rejection of the bid.

1. Bid Form
2. Bid Guaranty and Contract Bond
3. Certificate of Insurance
4. Ohio Workers' Compensation Certificate
5. Resumes of project manager and superintendent that will be representing your company on the project.

Prevailing Wage rates requirements are applicable to this Project.

All Bidders are strongly encouraged to attend the **Pre-Bid Meeting** and site walk-through on **February 25, 2025, at 1:00 p.m.** at the project location, **6844 Bale Kenyon Road, Lewis Center, OH 43035**

Bidders may obtain copies of the Bidding Documents from AlphaGraphics, 1254 Courtland Avenue, Columbus, OH 43201, Phone (614) 297-1200, Website: www.alphagraphics.com . Bidding documents may be purchased by payment of a nonrefundable amount (as determined by Alphagraphics) per each set of documents.

All questions for additional information should be directed to Kalpa Baghasingh at the office of the Architect at kbaghasingh@schooleycaldwell.com, in writing only. Bidders requiring clarification or interpretation of the bidding documents may email a question until **5:00 p.m.** on **March 6, 2025**, in order that responses can be addressed in an addendum.

All bids must be submitted in sealed envelopes and clearly marked with the project title. The cost of the project has been estimated to be approximately $4,600,000.

Bids received after the specified date and time will be considered late and will not be opened.

The Owner reserves the right to reject any and all bids, in whole or in part, to waive any defect in any or all bids. Each bid shall contain the full name and address of the bidder and all interested parties. No bid shall be withdrawn for a period of sixty (60) days after being opened.

END OF DOCUMENT

Advertised Delaware Gazette:
2/15/2025
2/22/2025

AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

THE OWNER:
(Name, legal status, address, and other information)

THE ARCHITECT:
(Name, legal status, address, and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

TABLE OF ARTICLES

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning _____ days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

DOCUMENT 00 22 13

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

These Supplementary Instructions to Bidders modify, change, delete from or add to the "Instructions to Bidders", AIA Document A701-2018. Where any Article of the Instructions to Bidders is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Instructions, the unaltered provisions shall remain in effect. The Supplementary Instructions to Bidders shall be read with, and as complementary with, the Instructions to Bidders and in the event of conflict, the Supplementary Instructions to Bidders shall govern.

The Articles of these Supplementary Instructions use Articles, numbers and titles which relate to the Instructions to Bidders. As an example, 1.2.3.4 refers to Article, Paragraph, subparagraph and supplementary clause of the Instructions to Bidders.

ARTICLE 2 – BIDDER'S REPRESENTATIONS

2.1.3.1 Bidder's site visit and familiarization shall include, but not be limited to, investigation of adjacent job site areas; means of approach to the site; relationship of the job site to other properties; facilities for delivery, storage, placing and handling of materials and equipment; other work, if any, being performed; other work in place; and any other obstacle, condition or relevant matter concerning the work to be performed.

2.1.3.1 The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, trade permits, and inspection requirements not otherwise indicated as provided by Owner. Building permit fee is to be paid by Owner.

2.1.5 The Bidder is a properly licensed Contractor according to the laws and regulations of the State of Ohio and meets qualifications indicated in the Procurement and Contracting Documents.

2.1.6 The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

ARTICLE 3 – BIDDING DOCUMENTS

3.2.1.1 Bidders shall promptly notify the Architect of any apparent inconsistency or conflict between the requirements of the Drawings and specifications and the requirements and recommendations of specified material manufacturers.

3.2.1.2 Questions or interpretations will also be received by email per the instructions in the Invitation to Bid.

3.2.2.1 Bidder's failure to request clarifications shall not relieve the successful Contractor of his responsibilities to perform the Work in compliance with the intent of the contract documents. The Contractor's bid shall include the cost of correcting any such error, inconsistency or omission, which could have been discovered by the exercise of reasonable diligence whether or not the error, inconsistency or omission was formally reported to the Architect or not. The execution of the Agreement shall be considered an implicit indication that the Contractor has a thorough comprehension of the full intent and scope of the contract documents.

3.2.4 The pre-bid meeting noted in the Invitation to Bidders will be held virtually at the date and time indicated and will be conducted by the Architect. Prime contract bidders should attend.

3.4.3 No addenda will be issued within seventy-two (72) hours of the published time for receipt of bids, excluding Saturdays, Sundays, and legal holidays, except an Addendum withdrawing the request for bids, or one which includes postponement of the date for receipt of bids.

ARTICLE 4 – BIDDING PROCEDURE

4.1.4.1 Amendments to the Bid Form, or inclusion of correspondence, or details, or written or printed matter, or any appendage other than as specifically called for may disqualify the bid.

4.1.5 Alternates, if any, must be responded to on the Bid Form. If alternates are selected by the Owner, the selection may be any or all of the alternates and taken in any order.

4.1.8 Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

4.2 BID SECURITY

4.2.1 Each bidder shall submit one of the statutorily required forms of bid security as set forth in O.R.C. Section 153.54 on the form included with the Contract Documents. There are two ways to meet these requirements:

i. OPTION #1: Submit the Combined Bid/Performance/Payment Bond on the form included with the Contract Documents along with the Bid; or,

ii. OPTION #2: Submit a certified check, cashier's check, or letter of credit pursuant to Chapter 1305 of the Revised Code, conditioned to provide that if the bid is accepted, the bidder, after the awarding or the recommendation for the award of the contract, whichever the contracting authority designates, will enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material. Any letter of credit shall be revocable only at the option of the Owner. The amount of the certified check, cashier's check, or letter of credit shall be equal to ten per cent of the bid. Any of the foregoing instruments shall be submitted with the PRESERVATION PARKS OF DELAWARE COUNTY listed as the payee or beneficiary. If the Bidder chooses option ii and is awarded the Contract, the Bidder shall then submit a Bond using the form included with the Contract Documents.

With any bond required, the Bidder shall submit or ensure:

i. *Ohio Department of Insurance Certificate*. Proof that the bond is issued by a surety company ("Surety") authorized by the Ohio Department of Insurance to transact business in the State of Ohio and acceptable to the Owner in the form of a certificate.

ii. *A Financial Statement*. Proof that the bond is issued by a Surety capable of demonstrating a record of competent underwriting, efficient management, adequate reserves, and sound investments. These criteria will be deemed to be met if the Surety currently has an A.M. Best Company Policyholders rating of "A-" better and has or exceeds the Best Financial Size Category of Class VI. Other Sureties may be acceptable to the Owner, in its sole discretion.

iii. *Proper signatures, credentials, and Power of Attorney*. The bond shall be signed by an authorized agent of an acceptable Surety and by the Bidder; and, include credentials showing the Power of Attorney of the agent.

iv. The name, address, and telephone numbers of the Surety and the Surety's Agent should be typed or printed on each bond.

4.3.1.1 Bids shall be accompanied by the following documentation. Failure to submit any part of this documentation shall be just cause for rejection of the bid.

1. Bid Form
2. Bid Bond or Bid Guaranty and Contract Bond
3. Certificate of Insurance
4. Ohio Workers' Compensation Certificate
5. Resumes of project manager and superintendent that will be representing your company on the project.

4.4.1.1 If the bidder receiving the accepted bid wishes to withdraw his bid from consideration, the request to do so must be in writing and filed with the Owner within two (2) business days after the conclusion of the bid submission procedure. Otherwise, bids may not be modified or canceled for a period of sixty (60) calendar days following the bid date. It is further required that any bidder making a request to withdraw his bid shall and must comply with all of the applicable and pertinent provisions of Section 9.31 of the Ohio Revised Code.

ARTICLE 5 – CONSIDERATION OF BIDS

5.3.1 The Owner may require a scope review meeting with selected responsive Bidders to obtain any information the Owner deems appropriate to the consideration of factors showing responsibility.

ARTICLE 6 – POST-BID INFORMATION

6.3.1 Prior to the award of a Contract, and prior to the start of any work, the Owner has the right to request further divisional summary break out of the bid.

6.2.3 The contractor will be asked to provide a divisional summary of the total sum of the bid after receipt of the bid.

ARTICLE 8 – ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

8.1.5 Drawings: Refer to Sheet G001 “Drawing Index.”

8.1.6 Specifications: Refer to Document 00 01 10 – Table of Contents.

ARTICLE 9 – ADDITIONAL REQUIREMENTS

9.2 In the hiring of employees, no contractor, subcontractor, or any person acting on its behalf, shall, by reason of race, creed, sex, handicap, or color, discriminate against any citizen of the state in the employment of labor or workers who is qualified and available to perform the work to which the employment relates:

9.3 No contractor, subcontractor, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work on account of race, creed, sex, handicap, or color.

9.4 All parties providing services for the Project to comply with all applicable federal, state and local laws in the conduct of the work.

END OF SECTION

DOCUMENT 00 41 16

BID FORM

TO: **PRESERVATION PARKS OF DELAWARE COUNTY**
2656 Hogback Road
Sunbury, OH 43074

PROJECT: **BICENTENNIAL BARN – MCCAMMON CREEK PARK**
6844 Bale Kenyon Road
Lewis Center, Ohio 43035

BIDS DUE: **March 13, 2025 at 3:00 PM local time**

SUBMITTED BY: _____
(Contracting Firm)

_____
(Street Address)

_____
(City, State, Zip Code)

_____
(Telephone)

Having inspected the site and the conditions governing said Project and carefully examined the Contract Documents, including (*list all Addendum issued):

ADDENDUM #_____DATED_____

ADDENDUM #_____DATED_____

ADDENDUM #_____DATED_____

ADDENDUM #_____DATED_____

The undersigned hereby agrees to furnish all labor and materials required to complete the Work included for the Base Bid(s) listed, for the prices stated hereafter. These prices cover all expenses incurred in performing the Work in strict accordance with the Drawings; the Project Manual which contains the Bidding Requirements, Contract Forms, Conditions of the Contract, Specifications; and Addenda, prepared by Schooley Caldwell, Architects/ Planners/ Interior Designers, 300 Marconi Blvd., Suite 100, Columbus Ohio 43215-2325.

The Undersigned hereby agrees:

1. To accept the award of the contract if it is made within sixty (60) calendar days after the bid opening.
2. To execute an agreement with the Owner on the form provided within ten (10) days after written notice of award, if award is made on the basis of this Bid.
3. To commence and complete the Work within the time stipulated herein.

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

BID SCHEDULE:

GENERAL CONTRACT

ITEM #1 GENERAL CONTRACT – BASE BID

ALL LABOR AND MATERIALS, for the sum of $ _____

Sum in words: _____and _____ /100 dollars.

ALLOWANCES

Refer to Section 01 21 00 for descriptions.

ITEM #1-A ALLOWANCE #1 – SLATE TILE BREAKAGE REPLACEMENT
Include allowance amount in the general contract – total base bid (Item #1) above :

ALL LABOR AND MATERIALS, for the sum of $ 10,000

Sum in words: Ten Thousand_____and _____ /100 dollars.

ITEM #1-B ALLOWANCE #2 – RECLAIMED TIMBER BEAMS
Include allowance amount in the general contract – total base bid (Item #1) above :

ALL LABOR AND MATERIALS, for the sum of $ 5,000

Sum in words: Five Thousand_____and _____ /100 dollars.

BID ALTERNATES

Refer to Section 01 23 00 – Alternates for description of each alternate

ITEM #2 ALTERNATE #1 – GRAVEL PATIO IN LIEU OF GRASS
If Alternate Is Accepted Add/Deduct (Circle One)

If Alternate is accepted, ADD TO / DEDUCT FROM Base Bid: $ _____

Sum in words: _____and _____ /100 dollars.

ITEM #3 ALTERNATE #2 – ASPHALT PARKING LOT IN LIEU OF GRAVEL
If Alternate Is Accepted Add/Deduct (Circle One)

If Alternate is accepted, ADD TO / DEDUCT FROM Base Bid: $ _____

Sum in words: _____and _____ /100 dollars.

ITEM #4 ALTERNATE #3 – EXTENDED CONCRETE PATH AND STAIRS ON HILLSIDE
If Alternate Is Accepted Add/Deduct (Circle One)

If Alternate is accepted, ADD TO / DEDUCT FROM Base Bid: $ _____

Sum in words: _____and _____ /100 dollars.

ITEM #5 ALTERNATE #4 – CHANDELIER LIFTS IN EVENT SPACE
If Alternate Is Accepted Add/Deduct (Circle One)

If Alternate is accepted, ADD TO / DEDUCT FROM Base Bid: $ _____

Sum in words: _____ and _____ /100 dollars.

ITEM #6 ALTERNATE #5 – ZIP SHEATHING IN LIEU OF CAVITY BATT INSULATION IN NEW ADDITION
If Alternate Is Accepted Add/Deduct (Circle One)

If Alternate is accepted, ADD TO / DEDUCT FROM Base Bid: $ _____

Sum in words: _____ and _____ /100 dollars.

NOTES:

1. All applicable portions must be filled in and the phraseology of the bid form must not be changed. Additions, qualifications or limitations must not be made to the item mentioned therein and any unauthorized conditions, limitations or provisions attached to a bid will be liable to render it informal and may cause its rejection. The right is reserved to reject any or all bids and to waive technical defects as the interest of the Owner may require.
2. Each bidder is to submit only one (1) original "Bid Form."

INSTRUCTIONS FOR SIGNING

1. The person signing for a sole proprietorship must be the sole proprietor or his authorized representative. The name of the sole proprietor must be shown below.
2. The person signing for a partnership must be a partner or his authorized representative.
3. The person signing for a corporation must be the president, vice president or other authorized representative; or he must show his authority, by affidavit, to bind the corporation.
4. The person signing for some other legal entity must show his authority, by affidavit, to bind the legal entity.

ACCEPTANCE

( ) BIDDER:
( )
( ) _____
( ) (Bidder Name and Title)
(CORPORATE SEAL)
( ) _____
( ) (Mailing Address)
( )
( ) _____
( ) (City)
(State)
(Zip)

_____ _____
(Federal Taxpayer Identification Number – TIN) (Telephone Number)

_____ _____
(Contact Person) (E-mail Address)

_____
(Authorized Signature –original signature only)

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

Type of Business Entity: _____
(corporation, partnership, individual, etc.)

Individual Members of the Firm:

_____

_____

President of Corporation_____

Secretary of Corporation_____

Corporation is organized under laws of the State of_____

Bid dated this _____day of _____ 20_____

END OF SECTION

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

BID GUARANTY AND CONTRACT BOND
(O.R.C. § 153.571 ORC)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

_____
("Contractor")

as principal and _____
as sureties, are hereby held and firmly bound unto the PRESERVATION PARKS OF DELAWARE COUNTY as obligee in the penal sum of the dollar amount of the bid submitted by the principal to the obligee on _____, 2025, to undertake the project known as **BICENTENNIAL BARN – MCCAMMON CREEK PARK** ("Project"). The penal sum referred to herein shall be the dollar amount of the principal's bid to the obligee, incorporating any additive or deductive Alternates made by the principal on the date referred to above to the obligee, which are accepted by the obligee. In no case shall the penal sum exceed the amount of

_____ Dollars

($_____). (If the foregoing blank is not filled, the penal sum will be the full amount of the principal's bid, including all add Alternates. Alternatively, if the blank is filled in, the amount stated must not be less than the full amount of the bid including all add Alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITIONS OF THE ABOVE OBLIGATIONS IS SUCH, that whereas the above named principal has submitted a bid for work on the Project.

Now, therefore, if the obligee accepts the bid of the principal and the principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the principal pays to the obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid and such larger amount for which the obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the principal pays to the obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid, or the costs, in connection with their resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if the obligee accepts the bid of the principal and the principal within ten (10) days after the awarding of the contract enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made a part of this bond the same as though set forth herein.

Now also, if the said principal shall well and faithfully do and perform the things agreed by contractor to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialmen or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of the said contract or in or to the plans or specifications therefore shall in any way affect the obligations of said surety

on its bond and does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or the work or to the specifications.

Signed and sealed this _____ day of _____, 20____.

_____
(Principal's Company Name)

_____
(PRINCIPAL) (Seal)

By: _____

Printed Name and Title: _____

_____
(SURETY) (Seal)

By: _____

Printed Name and Title: _____

_____

_____
SURETY'S ADDRESS

Surety's Telephone Number: _____

Surety's Fax Number: _____

_____
NAME OF SURETY'S AGENT

_____

_____
SURETY'S AGENT'S ADDRESS

Surety's Agent's Telephone Number: _____

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

☐ Not later than ( ) calendar days from the date of commencement of the Work.

☐ By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201™–2017, General Conditions of the Contract for Construction. Article 11 of A201™–2017 contains additional insurance provisions.

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's

property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Cause of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

☐ **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance,** to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

☐ **§ A.2.4.2 Ordinance or Law Insurance,** for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

☐ **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

☐ **§ A.2.4.4 Extra Expense Insurance,** to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

☐ **§ A.2.4.5 Civil Authority Insurance,** for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

☐ **§ A.2.4.6 Ingress/Egress Insurance,** for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

☐ **§ A.2.4.7 Soft Costs Insurance,** to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

☐ **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

☐ **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than _____ ($__) each occurrence, _____ ($__) general aggregate, and _____ ($__) aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal injury and advertising injury;
- **.3** damages because of physical damage to, or destruction of, tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the work involves such hazards.

.11 Claims related to explosion, collapse, and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than _____ ($__) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than _____ ($__) each accident, _____ ($__) each employee, and _____ ($__) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than_____ ($__) per claim and_____ ($__) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than_____ ($__) per claim and_____ ($__) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

☐ **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below.

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

☐ **§ A.3.3.2.2 Railroad Protective Liability Insurance,** with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate, for Work within fifty (50) feet of railroad property.

☐ **§ A.3.3.2.3 Asbestos Abatement Liability Insurance,** with policy limits of not less than _____ ($__) per claim and _____ ($__) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

☐ **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

☐ **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

☐ **§ A.3.3.2.6 Other Insurance**

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

DRAFT

AIA® Document C106™ – 2007

Digital Data Licensing Agreement

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Party transmitting Digital Data ("Transmitting Party"):
(Name, address and contact information, including electronic addresses)

« »
« »
« »
« »
« »

and the Party receiving the Digital Data ("Receiving Party"):
(Name, address and contact information, including electronic addresses)

« »
« »
« »
« »
« »

for the following Project:
(Name and location or address)

«Sample»
« »

In consideration of the following promises exchanged, the Parties agree as follows:

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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TABLE OF ARTICLES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 The purpose of this Agreement is to grant a license from the Transmitting Party to the Receiving Party for the Receiving Party's use of Digital Data on the Project, and to set forth the license terms.

§ 1.2 This Agreement is the entire and integrated agreement between the parties. Except as specifically set forth herein, this agreement does not create any other contractual relationship between the parties.

§ 1.3 Digital Data is defined as information, communications, drawings, or designs created or stored for the Project in digital form.

§ 1.3.1 Confidential Information is defined as Digital Data that the Transmitting Party has designated as confidential and clearly marked with an indication such as "Confidential" or "Business Proprietary."

ARTICLE 2 TRANSMISSION OF DIGITAL DATA

§ 2.1 The Transmitting Party grants the Receiving Party a nonexclusive limited license to use the Digital Data solely and exclusively to perform services or construction for the Project in accordance with the conditions set forth in Article 3.

§ 2.2 The transmission of Digital Data constitutes a warranty by the Transmitting Party to the Receiving Party that the Transmitting Party (1) is the copyright owner of the Digital Data, (2) has permission from the copyright owner to transmit the Digital Data and grant a license for its use on the Project, or (3) is authorized to transmit Confidential Information.

§ 2.3 The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights; nor does the Transmitting Party convey to the Receiving Party any right in the software used to generate the Digital Data.

§ 2.4 To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.

§ 2.5 The Receiving Party agrees to keep Confidential Information strictly confidential and not to disclose it to any other person except to (1) its employees, (2) those who need to know the content of the Confidential Information in order to perform services or construction solely and exclusively for the Project, or (3) its consultants and contractors whose contracts include similar restrictions on the use of Confidential Information.

ARTICLE 3 LICENSE CONDITIONS

§ 3.1 The parties agree to the following conditions on the limited license granted in Section 2.1:
(State below rights or restrictions applicable to the Receiving Party's use of the Digital Data, requirements for data format, transmission method or other conditions on data to be transmitted.)

« »

ARTICLE 4 LICENSING FEE OR OTHER COMPENSATION

§ 4.1 The Receiving Party agrees to pay the Transmitting Party the following fee or other compensation for the Receiving Party's use of the Digital Data:

(State the fee, in dollars, or other method by which the Receiving Party will compensate the Transmitting Party for the Receiving Party's use of the Digital Data.)

« »

This Agreement is entered into as of the day and year first written above and will terminate upon Substantial Completion of the Project, as that term is defined in AIA Document A201™–2007, General Conditions of the Contract for Construction, unless otherwise agreed by the parties and set forth below.
(Indicate when this Agreement will terminate, if other than the date of Substantial Completion.)

« »

TRANSMITTING PARTY *(Signature)*

« »« »
(Printed name and title)

RECEIVING PARTY *(Signature)*

« »« »
(Printed name and title)

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

TABLE OF ARTICLES

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(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or Suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

DOCUMENT 00 73 00

SUPPLEMENTARY CONDITIONS

The following supplements modify, change, delete from or add to the "General Conditions of the Contract for Construction," AIA Document A201, 2017 Edition. The Supplementary Conditions shall be read with and as complementary to the General Conditions, and are hereby made a part of the Contract. In the event of conflict, the Supplementary Conditions shall govern. Where any Article of the General Conditions is modified or any Paragraph, subparagraph or clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, subparagraph or clause shall remain in effect; provided however, if not incorporated therein, the Contract shall also be deemed to be amended to the extent necessary as required to comply with applicable provisions of Ohio law in effect on the date of the Contract execution. The Articles of the Supplementary Conditions use titles and numbers that relate to the General Conditions.

ARTICLE 1 – GENERAL PROVISIONS

1.2.4 Should the Contract Documents disagree as to quality or quantity of work required, the better quality or greater quantity shall be provided unless instruction is otherwise given by the Owner in writing.

1.2.5 Where the Contract Drawings show only a portion of the work in full detail and the remainder is shown only in outlining, the portions in outline shall be executed as required for like portions shown in full detail. Where ornament or other detail is shown by starting only, such detail must be continued throughout the parts in which it is shown and throughout all other similar parts of the work unless otherwise explicitly required. Where items are shown in diagrammatic/schematic drawings, Contractor shall verify location with the Architect before installation.

1.2.6 Sections of Division 01 – General Requirements govern the execution of the work of all sections of the specifications.

1.5.2.1 By executing the Contract, the Contractor represents and affirms that he has become familiar with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work.

ARTICLE 2 – OWNER

2.1.3 The Owner shall not be responsible for or have control or charge of the construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work; and shall not be responsible for the Contractor's failure to carry out the Work in accordance with the requirements of the Contract Documents. The Owner shall not be responsible for the acts or omissions of the Contractor or other contractors, any of their suppliers, agents or employees or any other persons performing any work on the Project.

2.1.4 The Owner shall not be responsible for the failure of the Contractor to plan, schedule and perform the Work in accordance with the Contractor's Construction Schedule or the failure of the Contractor to cooperate with the other Contractors to meet scheduled completion dates or the failure of the Contractor to schedule and coordinate the work of the Contractor's own Subcontractors.

ARTICLE 3 – CONTRACTOR

3.1 GENERAL

3.1.1.1 The Contractor shall be licensed in the State of Ohio.

3.1.3.1 The Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither certification of any progress or final payment by the Architect, nor issuance of a certificate of substantial or final completion, nor any payment by the Owner to the Contractor, nor any use or occupancy of the Work or any part thereof by the Owner, nor any act of acceptance by the Owner, nor any review and approval of a submittal shall constitute an acceptance of Work not in accordance with the requirements of the Contract Documents or release the Contractor of its obligation to perform the Work in accordance with the Contract Documents.

3.2 Review of Contract Documents and Field Conditions by Contractor.

3.2.1 *(replace)* Execution of the Contract by the Contractor is a representation that the Contractor has (i) conducted a thorough investigation of the Site, the Contract Documents and other documents made available to the Contractor by the Owner, (ii) carefully investigated and considered the need to coordinate the Work with the work of other contractors, the possibility of delay in the various components of the Work, the possibility of obstacles and conditions not identified by the Owner (and the cost to the Contractor and impact on its schedule of such unidentified items), conditions relating to the transportation, handling and storage of materials, availability of labor, the effect of any labor agreements, weather, applicable provisions of law and the character and availability of equipment, material and facilities needed before and during the prosecution of the Work, (iii) reviewed all plans, specifications, drawings, reports and other materials with respect to the Project and its systems, (iv) considered staging, access and materials and equipment delivery issues, and evaluated all other matters and conditions of the Site which may affect the provision of Contractor's services and completion of the Contractor's Work. Contractor acknowledges that as a result of its inspections and other research with respect to the Site, except as otherwise provided in the Contract Documents, it assumes all risk of conditions to be encountered and the character, quality and quantities of services to be provided for the complete, timely and satisfactory performance of the Contractor's Work.

3.2.3.1 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that (i) differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents or (ii) which could not have been reasonably observed or inferred by the Contractor based on prior inspections, tests, reviews, information provided by the Owner or pre-construction services conducted by the Contractor, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 21.

3.3.1.1 The Contractor shall be responsible for coordinating the Work of the Project, scheduling the Project, and providing other services identified in the Contract Documents as this Contractor's responsibility.

3.4 Labor and Materials

3.4.3.1 If the Owner or the Architect deems any employee of the Contractor or subcontractor unsatisfactory, the Contractor will transfer or require its subcontractor to transfer such employee from the Project immediately.

3.4.4 Manufactured articles, materials, and equipment shall be supplied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer unless herein specified to the contrary.

3.4.5 Place orders for materials and equipment to be incorporated into the Work as soon as possible after the award of the Contract and receipt of approvals where applicable. Keep the Architect informed as to the availability of all specified materials and equipment. Nothing herein shall relieve the Contractor from his obligation to complete the Project within the specified time period.

3.4.6 Furnish such employees, materials, facilities and equipment and shall work such hours, including extra shifts, overtime operations and Sunday and holidays as may be necessary to ensure the prosecution and completion to the Work in accordance with the Contractor's Construction Schedule. If work is not being performed in accordance with the Contractor's Construction Schedule and it becomes apparent that the Work shall not be completed within the Contract Time, as necessary to improve its progress, take either or both of the following actions, at no additional cost to the Owner.

3.4.6.1 Increase the number of employees in such crafts as shall regain lost schedule progress; and

3.4.6.2 Increase the number of working hours per shift, shifts per working day, working days per week, the amount of equipment of any combination of the foregoing to regain lost schedule progress.

3.4.7 In addition, the Owner or Architect may require the Contractor to prepare and submit a recovery schedule demonstrating the Contractor's program and proposed plan to regain lost schedule progress

and to ensure completion of the Work within the Contract Time. If the Owner or Architect finds the proposed plan not acceptable, the Contractor may be required to submit a new plan. If the actions taken by the Contractor or the second proposed plan are not satisfactory, the Owner or Architect may require the Contractor to take any of the actions set forth in Paragraph 3.4.5 without cost to the Owner.

3.5 Warranty

3.5.3 Any defects which arise from a breach of the foregoing warranties, or any other warranties provided by Contractor, its subcontractors or material suppliers, shall be corrected in accordance with Article 12. Upon final completion of the Work, assign to the Owner all warranties obtained or obtainable by the Contractor from manufacturers and suppliers of equipment and materials incorporated into the Work by written instrument of assignment in a form acceptable to the Owner. Perform the Work in such manner as to preserve all manufacturer's warranties.

3.5.4 Workmanship shall be of the best quality possible. Each part of the Work and activity shall be pursued with the best possible workmanship, producing work that is neat, secure, weatherproof; with the best possible appearance and utility. The Contractor warrants and guarantees that the Owner will have good title to the Work and that the Work and all materials and equipment incorporated into the Work will fit for the purpose for which they are intended.

3.7 Permits, Fees, Notices and Compliance with Laws

3.7.1.1 Procure all permits, certificates of inspection, pay all fees in excess of the inspection fees included in the building permitting process, and give all notices necessary and incidental to the due and lawful prosecution of the Work. Certificates of inspection, use and occupancy shall be delivered to the Owner upon the completion of the Work in sufficient time for occupation of the Project in accordance with the Project schedule.

3.7.1.2 The Architect will obtain and pay for plan approval through the Delaware County Building Code Department.

3.9 Superintendent

3.9.1.1 The construction superintendent shall be present on the site of the work when work is being performed.

3.10 Contractor's Construction and Submittal Schedules

3.10.1.1 The Contractor's Construction Schedule shall be acceptable to the Owner and Architect as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance shall neither impose on the Owner or Architect responsibility for the progress or scheduling of the Work nor relieve the Contractor from full responsibility therefore. No progress payments shall be processed until the Contractor's Construction Schedule has been properly prepared and submitted by the Contractor.

3.12 Shop Drawings, Product Data and Samples

3.12.1.1 Before submission of each submittal, determine and verify all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and review or coordinate each submittal with the other related submittals and with the requirements of the Work and the Contract Documents.

3.13 Use of Site

3.13.1 Damage to drives, walks, or other features of the site, resulting from hauling, storage of materials, or other activity connected with the work, shall be repaired by the Contractor concerned, at his expense, and to the satisfaction of the Owner and Architect.

3.15 Cleaning Up

3.15.1.1 Site and building areas, roads and sidewalks used in the progress of the Work, both within the limits of the construction site and the adjacent areas leading to it, shall be maintained opened to travel and kept in clean condition. Inspect these areas on a daily basis and remove any debris or clean as required to maintain its original condition. Failure to so maintain said areas, which results in Owner's cleaning of same, shall be charged to the Contractor.

3.16 Access to Work

3.16.1 Refer to Division 01 Section 01 50 00 – Temporary Facilities and Controls for requirements for Architect's access to all portions of the Work while in progress, and for inspections to determine adequate completion of the Work.

3.18 Indemnification

3.18.1(delete) "Other than the work itself"

3.18.1.1 The Contractor shall Indemnify and hold the Owner harmless from (1) any claims of mechanics liens, or liens against funds owed to the Contractor, which are made by subcontractors, regardless of tier, or material suppliers or laborers, and from all costs and expenses, including attorneys' fees, resulting from such claims, and (2) from any claims, damages or expenses, including attorneys' fees resulting from the Contractor's breach of his obligations hereunder.

ARTICLE 7 – CHANGES IN WORK

7.2 Change Orders

7.2.2 All proposals for changes to the Contract Sum shall be submitted to the Architect and shall include a detailed breakdown of the costs or credits resulting from a change in the Work with costs itemized for both labor and materials. In addition to Contractor costs, the breakdown shall include the costs of work performed by subcontractors and sub-contractors as applicable for the Change Order, including overhead and profit allowances. The costs or credits as applicable shall be properly itemized to include the following:

1. Quantities and unit costs or lump sum costs of materials supplied and delivered to the site.
2. Manhours of labor and hourly rates for each trade classification of labor involved, including trade foremen.
3. Direct costs, including purchase and rental value of fuel, supplies, scaffolding, construction equipment, power tools, insurance and bond premiums.

7.2.2.1 The allowance for overhead and profit combined included in the total cost to the Owner shall not exceed the following schedule:
For the Contractor, for any work performed by his own forces, fifteen (15) percent of the cost.

For each subcontractor involved, work performed by his own forces, fifteen (15) percent of the cost.

For the Contractor, for work performed by subcontractor, ten (10) percent of the subcontractor's cost plus percentage fee as defined above.

7.2.2.2 Overhead shall include the following: Bond premiums, supervision, superintendent, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expense, Workers' Compensation Insurance, and all other expenses not included in "Cost."

7.2.2.3 If the net value of a change or deletion results in a credit to the Owner, the credit shall be net cost without overhead and profit.

ARTICLE 8 – TIME

8.1 Definitions

8.1.4.1 When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday, Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

8.3 Delays and Extensions of Time

8.3.1*(replace)* If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify

delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine. Contractor must provide written notice to the Owner of such delays as required in Article 15. The failure to give such notice will constitute an irrevocable waiver of the Contractor's right to seek an extension for such delay. The only delays for which the Contractor will be entitled to an extension of the time for completion will be delays caused by (i) physical damage to the Project over which the Contractor has no control; (ii) unusually severe weather conditions not reasonably anticipatable (temperature, rain, or other precipitation within a range of twenty percent of normal amounts for the time of the year shall not be considered unusually severe weather conditions); and (iii) the proximate result of the Owner's act or failure to act. Contractor is not entitled to damages from the Owner for delays caused by another contractor.

8.3.1.1 The Contractor is not be entitled to damages from any alleged acceleration, either constructive or actual, in the performance of the Work resulting from acts or failure to act of the Owner, the Architect or the employees, agents, or representatives of the Owner or the Architect unless the Contractor has made a written request to the Owner for an extension of time in accordance with Article 15.1.6 and that request is denied.

8.3.1.2 Claims relating to time shall be made in accordance with Section and applicable provisions of Article 15.

8.3.1.3 Failure, neglect, and/ or refusal to complete the Work within the provisions of the approved construction schedule or by the Substantial Completion date, or if it is determined that Contractor's delays directly delay Substantial Completion or any Project milestone requirement, Contractor will be subject to liquidated damages (not a penalty) at the rate set forth below per calendar day for the total number of days the Work or milestone requirement is delayed beyond the Substantial Completion date:

LIQUIDATED DAMAGES

Contract Amount	Dollars Per Day
$1.00 to $100,000.00	$250.00
$100,000.01 to $500,000.00	$500.00
$500,000.01 to $2,000,000.00	$1,000.00
$2,000,000.01 to $5,000,000.00	$2,000.00
$5,000,000.01 to $10,000,000.00	$2,500.00
$10,000,000.01 or more	$3,000.00

8.3.1.4 The Contractor acknowledges that it is contracting with a political subdivision and that certain decisions relating to the Project will be submitted to the Owner's governing board for its consideration. The governing board will consider a written request for an extension of time for one of the permitted reasons in Article 15 at the next practicable meeting. The Contractor agrees that this is a necessary and essential part of the operation of the Owner and that the Contractor shall not be entitled to any damages resulting from delays during this time period so long as the governing board or its authorized representative responds to the Contractor within a reasonable time after that meeting.

8.3.1.5 Notwithstanding anything to the contrary in Section 15, within five (5) working days after the commencement of any condition which is causing or may cause delay in completion, the Contractor must notify the Owner in writing of the effect, if any, of such condition upon the time progress schedule, and must state why and in what respects, if any, the condition is causing or may cause such delay.

8.3.1.6 Any Claim for increased cost for delay shall be asserted in accordance with the provisions of this Agreement unless the time is extended in writing by Owner. This requirement is of the essence of the Contract Documents. Accordingly, no course of conduct of dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is in fact any such unjust enrichment, shall be the basis for any claim to an increase in the Contract Sum or an extension in the Contract Time.

ARTICLE 9 – PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

9.2.1 The schedule of values shall be prepared in such a manner that each major item of Work and each subcontracted item of Work is shown as a single item on the Owner's standard application for payment form, with labor and materials itemized separately. The schedule of values shall be supplemented by such supporting information as the Architect may require. Labor and materials shall be itemized separately on the application for payment form for each line item. The Architect, subject to the Owner's approval, may from time to time adjust the schedule if the Architect determines it to be in any way unreasonable or inaccurate.

9.3 APPLICATION FOR PAYMENT

9.3.1.1 *(Add)* Use the American Institute of Architects' standard application for payment form. Applications shall be submitted monthly on or before the date of the month specified by the Architect electronically (via email) in PDF format. Submit with the final monthly application for payment form, electronic copies (in PDF format) of the project superintendent's daily field reports.

9.3.2.1 Payments for labor incorporated into the Work will be at the rate of 92 percent of the amount set forth in the Contractor's Application for Payment and approved by the Architect until the Work is 50 percent complete. When the Work is 50 percent complete, the payment for labor incorporated into the Work will be at the rate of 100 percent of the amount set forth in the Contractor's Application for Payment and approved by the Architect.

.1 There shall be paid to the Contractor a sum at the rate of 92 percent of the invoice costs, not to exceed the bid price in a unit price contract, of material delivered on the site of the Work, or other storage site as set forth in Article 9.3.2 herein provided such material has been inspected by the Architect and has been found to meet the requirement of the Contract Documents. The balance of such invoiced value shall be paid when such material is incorporated into and becomes a part of such building, construction, addition, improvement, alteration, or installation.

.2 Partial or full payment to the Contractor(s) for material, equipment, or Work in place shall not start any applicable warranty period.

.3 The full contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect or if the surety withholds his consent, or for other good and sufficient reasons.

9.3.2.2 The amounts due to the Contractor as work progresses shall be in accordance with the Architect's estimate at the time that the payments become due.

9.3.2.3 There shall be paid to the Contractor a sum at the rate of ninety-two (92) percent of the invoice costs, of material delivered on the site of the work or other approved storage site. The balance of such invoiced cost shall be paid when such material is incorporated into and becomes part of such building, construction, addition, improvement, alteration or installation.

9.3.2.4 All monies paid on account to any Contractor for labor and materials shall be regarded as funds in his trust for payment of any and all obligations relating to the Contract and no such amount or monies shall be permitted to accrue to the Contractor until all such obligations are satisfied. When the Contract is ninety (90) percent complete, and thereafter, all requests for payment shall be accompanied by executed affidavit forms stating; (1) that all payrolls, bills for material and equipment, and other indebtedness connected with the Work for which the previous application was submitted and the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, and; (2) releases or waiver of liens arising out of the Contract from each subcontractor, material man, supplier and/or laborer of the Contractor.

9.4.3 Further, the Architect is not obligated to issue any Certificate of Payment covering work by the Design/Build contractors or subcontractors, work by Owner's separate contractors, or other work for which the Architect is not providing full services.

9.5.2.1 If the Contractor disputes any determination by the Architect with regard to a Certificate for Payment, the Contractor nevertheless expeditiously shall continue to prosecute the Work.

9.5.5 If the Contractor disputes any determination by the Architect or the Owner with regard to any Certificate for Payment, he shall nevertheless expeditiously continue to prosecute the Work, provided Contractor has been paid in full for the undisputed amounts due and owing in accordance with the payment schedule set forth in the Contract Documents. If the Architect declines to certify payment and

withholds its Certificate for Payment for any reason, the Architect shall promptly notify the Owner in writing of such reasons therefore.

9.5.6 If the Owner is entitled to reimbursement or payment from the Contractor pursuant to the Contract Documents, the payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

9.6.1.1 The Owner shall make payment, in the amount approved by the Architect on a certificate of payment, within thirty (30) calendar days of receipt of said approved certificate.

9.6.1.2 All monies paid on account to any Contractor for labor and materials shall be regarded as funds in his trust for payment of any and all obligations relating to the Contract and no such amount or monies shall be permitted to accrue to the Contractor until all such obligations are satisfied. When the Contract is ninety (90) percent complete, and thereafter, all requests for payment shall be accompanied by executed affidavit forms stating; (1) that all payrolls, bills for material and equipment, and other indebtedness connected with the Work for which the previous application was submitted and the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, and; (2) releases or waiver of liens arising out of the Contract from each subcontractor, material man, supplier and/or laborer of the Contractor.

9.8 SUBSTANTIAL COMPLETION

9.8.1 *(replace)* Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that (i) the Owner can occupy or utilize the Work or designated portion thereof for its intended use; (ii) the punchlist has been prepared pursuant to standard industry practice; (iii) the Architect or Owner have determined that the Work has been substantially completed in accordance with this Agreement; and (iv) the Contractor has obtained approval from the local governmental authority permitting occupancy.

9.8.3.1 Except with the consent of the Owner, the Architect will perform no more than two inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections.

9.8.3.2 If upon this subsequent inspection, Contractor has not yet completed the Work, and further field reviews by Architect are required, the Contractor is responsible to Owner for any additional cost to Owner for further reviews by the Architect.

9.8.3.3 The time fixed by the Architect for the completion of all items on the "punch list" accompanying the certificate of substantial completion shall not be greater than thirty (30) days. Complete all items on the list within such thirty (30) day period. If the Contractor fails to do so, the Owner in its discretion may perform the work by itself or others and the cost thereof shall be charges against the Contractor.

9.10.6 Final payment, including retainage and accumulated interest, will be due to the Contractor thirty (30) days after the completion and acceptance of all work under the Contract, subject to satisfactory submissions of all documentation required under 9.10.3 of the Supplementary Conditions.

ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

10.2.2.1 Provide, erect, brace, shore, or in every way protecting work in compliance with state and local codes, and all U.S. Occupational Safety and Health Administration (OSHA) regulations. Contractor is responsible for the adequacy in performance of his temporary work. Use utmost care to protect the work in progress and, upon removal protect all surrounding existing work.

10.2.2.2 Comply with Occupational Safety and Health Act of 1970, as outlines in Federal Register, Volume 36, Number 75, Part II, dated Saturday, April 17, 1971, Department of Labor, Bureau of Labor Standards, Safety and Health Regulations for Construction.

10.3.1.1 Do not introduce explosives or other hazardous materials or equipment to the site.

ARTICLE 11 – INSURANCE AND BONDS

Insurance coverages are now under Exhibit A of AIA A101

ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

12.2.1.1 If the Contractor, a Subcontractor, or anyone for whom either is responsible, damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such damage to be repaired at no expense to the Owner.

12.2.2.1 At the end of the first sentence insert the following "...and shall complete the corrections within thirty (30) days of such notice."

12.3.1 The acceptance of nonconforming Work by the Owner shall be by written Change Order signed by the Owner's authorized representative. No person has the authority to accept nonconforming Work except pursuant to such written Change Order.

ARTICLE 13 – MISCELLANEOUS PROVISIONS

13.1.1 This project is subject to and governed by the laws of the State of Ohio.

13.4.6.1 Inspections or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

13.4.7 Neither observations by the Owner or Architect nor inspections, tests or approvals by others shall relieve the Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Documents.

13.6 STANDARD FORMS AND PROCEDURES

13.6.1 Information required to be submitted to the Architect after the Owner’s approval of the Contractor's proposal, but prior to the signing of the Contract, as specified herein, includes, but is not limited to, the following:

1. Insurance Certificates with attached Powers of Attorney and Certificate of Compliance as defined in AIA Document A101– 2017 Exhibit A.

13.6.2 Information required to be submitted to the Architect at the Pre-construction Conference, and without which work shall not proceed, as specified herein, includes, but is not limited to, the following:

1. Construction Schedule as defined in Section 01 33 00 – Submittal Procedures.
2. Emergency telephone list, including all responsible parties associated with the Project.
3. Pre-construction Conference documentation as defined in Section 01 31 00 – Project Coordination.

13.6.3 Information required to be submitted during the course of the project, as specified herein, includes, but is not limited to, the documentation as defined in Section 01 33 00 – Submittal Procedures.

13.6.4.1 Information required before authorization of final payment, as specified herein, includes, but is not limited to, the following as applicable:

1. Certification of Inspection by concerned government agencies and "permit" set of Contract Documents, if required.
2. Contractor's Project Superintendent Daily Field Reports in two copies.
3. Contractor's Affidavit of Payment of Debts and Claims, AIA G706.
4. Contractor's Affidavit of Release of Liens, AIA G706A.
5. Consent of Surety Company to Final Payment, AIA G707.
6. Contractor's letter stating work is completed, and requesting final payment.
7. Contractor's one (1) year period for correction of Work form.
8. Miscellaneous specified guarantees when in excess of one (1) year.
9. Miscellaneous maintenance or operating instructions as required and/or specified.
10. Receipts for specified additional materials delivered to the Owner.

11. Certificate of Substantial Completion, AIA G704.
12. Project closeout information as defined in Section 01 77 00 – Closeout Procedures.

13.8.4.12 Other data required by the Owner establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designed by the Owner.

ARTICLE 14 – TERMINATION OR SUSPENSION OF THE CONTRACT

14.2.5 After termination pursuant to this Subparagraph, the Contractor shall unless any notice of termination directs otherwise, immediately discontinue the Work on that date, place no further orders or subcontracts or materials, equipment, services, or facilities, except as may be necessary for the completion of such portion of the Work as is not discontinued; promptly make every effort to procure cancellation upon terms satisfactory to the Owner of all orders and subcontracts to the extent they relate to the performance of discontinued portion of the Work; and thereafter do only such Work as may be necessary to preserve and protect the Work already in progress and to protect materials, and equipment, and equipment on the Site or in transit thereto.

14.2.6 When the Contractor's services have been terminated by the Owner pursuant to this Subparagraph, the termination shall not affect any rights or remedies of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment or moneys due the Contractor by the Owner shall not release the Contractor from liability for performance of the Work in accordance with the requirements of the Contract Documents.

ARTICLE 15 – CLAIMS AND DISPUTES

CLAIMS FOR ADDITIONAL COST

15.1.5*(replace)*If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice shall be provided to the Owner within five working days of the event giving rise to the Claim. Further, give such written notice before proceeding to execute the Work. Such notice shall include, to the extent then known by Contractor, full details and substantiating data to permit evaluation by the Owner and the Architect. If further, or other, information subsequently becomes known to the Contractor, it shall be promptly furnished to the Owner and the Architect in writing. Prior notice is not required for Claims relating to an emergency endangering life or property. Failure to provide written notice shall constitute an irrevocable waiver of Contractor’s right to pursue any adjustment to the Contract Sum or Contract Time.

ARTICLE 16 – EQUAL OPPORTUNITY

16.1 The Contactor shall maintain policies of employment as follows:

16.1.1 The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. Take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, sexual orientation. national origin or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth in policies of non-discrimination.

16.1.2 The Contractor and all Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, national origin or age.

END OF SECTION

Document 00 73 43 - Wage Rate Requirements
State of Ohio Standard Requirements for Public Facility Construction

PREVAILING WAGE RATES

1.1 Payment of Prevailing Wage Rates

1.1.1 The Contractor shall pay the prevailing wage rates of the Project locality, as issued by the Ohio Department of Commerce, Wage and Hour Bureau to laborers and mechanics performing Work on the Project.

1.1.2 The Contractor shall comply with the provisions, duties, obligations, and is subject to the remedies and penalties of ORC Chapter 4115.

1.1.3 If the Contractor or its Subcontractors fail to comply with ORC Chapter 4115, the Contracting Authority may withhold payment pursuant to **Section 9.8.2.5** of the **General Conditions**. The Contractor is liable for violations committed by the Contractor or its Subcontractors to the extent provided in ORC Chapter 4115.

1.1.4 The Contractor shall submit all payroll reports in compliance with the requirements of **Section 1.2** for all employees of the Contractor and of the Contractor's Subcontractors.

1.1.5 By executing a Contract, the Contractor certifies that it based its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Wage and Hour Bureau for the Project as provided in ORC Sections 4115.03 through 4115.14, which are inserted at the end of this Document.

1.2 Prevailing Wage Rate Revisions

1.2.1 The Contracting Authority shall, within 7 business days after receipt of a notice of a change in the prevailing wage rates, notify the Contractor of the change. The prevailing wage rates are available at the Ohio Department of Commerce's web site: http://com.state.oh.us/.

1.2.2 The Contractor shall pay any revised wage rates issued during the term of the Contract.

1.3 Payroll Schedule

1.3.1 Within 10 days of the date of the Notice to Proceed, the Contractor shall provide the Contracting Authority's Prevailing Wage Coordinator a schedule of dates during the term of the Contract on which wages shall be paid to employees for the Project.

1.4 Payroll Reports

1.4.1 The Contractor shall submit payroll reports with each Contractor Payment Request, which reports shall be certified by the Contractor that the payroll is correct and complete, and that the wage rates shown are not less than those required by the Contract. The Contractor is responsible for submitting all payroll reports of its Subcontractors.

1.4.1.1 Each payroll report shall indicate the period covered and include a list containing the name, address, and last four digits of the social security number of each employee of the Contractor and its Subcontractors paid for the Work.

1.4.1.2 Each payroll report shall list the number of hours each employee worked each day on the Project during the reporting period, the total hours each week on the Project, the employee's hourly rate of pay, job classification, hourly rate of fringe benefits, and all deductions from wages and net pay.

1.4.1.3 Each payroll report shall list each fringe benefit and state if it is paid as cash to the employee or to a named plan.

1.4.1.4 The Contractor and its Subcontractors shall submit apprenticeship agreements for all apprentices utilized on the Project with the first payroll report from the Contractor or its Subcontractor that includes apprentices.

END OF DOCUMENT

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Project information
2. Project description
3. Contract documents
4. Access to site
5. Work restrictions
6. Owner furnished contractor-installed products
7. Specification and drawing conventions

B. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.

1.02 PROJECT INFORMATION

A. General: Project name is **BICENTENNIAL BARN – MCCAMMON CREEK PARK** as shown on Contract Documents prepared by Schooley Caldwell.

B. The OWNER is:

Preservation Parks of Delaware County
Matt Simpson, Sr. Park Planner
2656 Hogback Road
Sunbury, OH 43074

C. The ARCHITECT is:

SCHOOLEY CALDWELL ASSOCIATES, INC.
Architects/Planners/Interior Designers
300 Marconi Blvd., Suite 100
Columbus, Ohio 43215

D. The CONTRACT DOCUMENTS for the Project were prepared by the Architect. Contract Documents are dated February 14, 2025.

E. Contract Documents indicate the work of the Contracts and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to, the following:

1. Existing site conditions and restrictions on use of the site.
2. Work to be performed subsequent to work under this Contract.
3. Requirements for Owner occupancy during the Work.

1.03 PROJECT DESCRIPTION

A. This section outlines the scope of work included in the project BICENTENNIAL BARN – MCCAMMON CREEK PARK in Lewis Center, OH.

B. The project consists of dismantling the existing historic bicentennial barn and relocating and rebuilding it in a new location on the site. It will be weatherized and enclosed in a thermal envelope 'shell' to allow year-around use as a special events facility. The barn structure will be placed on a new foundation. Accompanying the barn structure will be an attached addition of approximately 1200 square feet which will include circulation space, restrooms, office space, a server kitchen, storage, and stairs to basement.

C. The Barn is a traditional bank barn and will be comprised of two levels, an upper level, accessed directly from the parking area, containing a large multi-Purpose event space, and a lower level, effectively a walk-

out basement containing storage and mechanical spaces. The historic architectural character of the existing barn will be preserved, Ohio logo and heavy timber construction will be maintained.

D. The Work includes site infrastructure to support the new construction.

E. Summary by References: Work of the Contracts can be summarized by references to the Agreement, General Conditions, Specification Sections, Drawings, Addenda and Modifications to the contract documents issued subsequent to the initial printing of this project manual and including, but not necessarily limited to, printed material referenced by these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions and other forces outside the contract documents.

1.04 CONTRACT

A. The project will be constructed under a single-prime general contracting arrangement.

B. Intent of Contract: The drawings and specifications of the contract are intended to require the contractor to provide for everything reasonably necessary to accomplish the proper and complete finishing of the work.

1. Work and materials included in the specifications and not shown on the drawings, or shown on the drawings and not in the specifications, shall be performed and furnished by the contractor as if described in both.
2. Incidental materials and work not specified in the drawings and the specifications which are, nevertheless, necessary for the true development thereof and reasonably inferable therefrom, the contractor shall understand the same to be implied and required, and shall perform such work and furnish such materials as if particularly delineated or described therein.
3. In cases of errors between the drawings and specifications, the most stringent constraints of the conflicting information shall be assumed by the Contractor and it shall be the Contractor’s responsibility to complete the work as reasonably required, consistent with the intent of such drawings and specifications.

1.05 PROJECT CONDITIONS

A. Work shall be performed in accordance with applicable Federal, State, and local code requirements and publications.

B. Supply, install, and maintain barriers, protection, warning lines, lighting, and personnel required to segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, its occupants, and the surrounding landscaped and paved areas. Observe applicable OSHA requirements.

C. Schedule and execute work without exposing the building interior to the effects of inclement weather. Protect the building and its occupants against such risks and repair/replace work related damage.

D. Supply labor, equipment, tools and appliances necessary for the proper completion of the work.

E. Schedule, execute, and coordinate work on a daily basis so that components are installed completely and permanently as specified.

F. Supply shoring, supports, and other items or materials necessary to brace and support the structure, fixtures, and facilities affected by the work.

G. Coordinate the work in this Section with other Sections, including preparatory work, building protection, daily clean-up, and protection of building, with occupants.

1.06 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference will be held with the Owner, Contractors, Architect, Manufacturer Representatives and involved trades to discuss aspects of the project. The Contractor's foreman or field representative will attend this conference. The foreman must be on site at times that work is performed.

B. The preconstruction conference shall not be held until specified submittals have been received, reviewed and accepted as to form by the Architect.

C. Delivery of materials and commencement of construction shall not proceed until the preconstruction conference is held. Delays in obtaining a complete set of submittals shall not extend the contracted completion date.

1.07 CONSTRUCTION SCHEDULE

A. Proper coordination of all aspects of the work by the Contractor and sub-trades is critical to ensure proper installation and performance of the work. The Contractor's Construction Schedule shall clearly outline the coordination between job tasks of all involved disciplines. Subject to review and acceptance by the Architect, this Schedule will be adhered to by the Contractor and sub-trades.

B. The Contractor's Construction Schedule shall clearly identify the on-site crew foreman and the size of the crew to be utilized. The crew size shall remain consistent and work shall be continuous throughout the project, from start-up to completion.

1.08 WORK RESTRICTIONS

A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes.

B. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

C. Personnel Restrictions:

1. Employee Behavior: Workers shall conduct themselves in a business-like manner at all times.
2. Restrict area for employee breaks and eating. Keep site clean.
3. No loud radios or foul language will be allowed.
4. No catcalls or other offensive language directed to the Owner's employees, visitors or the public will be permitted.
5. Employees must wear shirts.

1.09 PERMITS

A. The Contractor shall procure and pay for permits required, licenses and approvals necessary for the execution of his contract and is responsible for fees for permit inspection. Building plan review has been submitted and paid for by the Architect. The Contractor must submit and pay for the Building Permit application.

1.10 CONTRACT DOCUMENTS

A. The Contract Documents are defined in the Agreement.

B. Project work shall be executed in accordance with the Contract Documents. Contractors shall provide items, articles, materials, equipment, operations or methods listed, required to be provided by reason of the drawings or part of the other Contract Documents, including labor, materials, equipment and incidentals required or necessary for completion within the time specified in the Contract Documents.

C. Contractors and subcontractors are responsible for examination of the Contract Documents to ascertain the full extent of the work under their contract. Work installed under the Contract that must be changed, and which could have been avoided by the foregoing reference, shall be changed and paid for by the Contractor.

1.11 CONTRACTORS USE OF PREMISES

A. Confine operations at the site to the areas within the construction limits. Portions of the site beyond areas on which work is indicated are not to be disturbed. Comply with site rules and regulations affecting the work while engaged in project construction.

B. Parking of Construction Personnel: Parking is available on and adjacent to the project site.

C. Cooperate with the Owner regarding site utilization matters to achieve maximum practical use of the site while maintaining essential uses of the site by the Owner. Performance of work shall not interrupt the day to day operation of the Owner and shall not decrease the safety and security of its staff and the public.

D. Supervise the work and be solely responsible for construction means, methods, techniques, sequences, dimensions and procedures and for coordinating the Work. Construction techniques or activities which decrease the building security or safety are not permitted. Coordinate fully with the Owner's requirements regarding security and safety of the building and premises.

E. Contractors shall deliver and store materials and construction equipment to the limited exterior areas designated by Owner for such storage use. Deliver bulk materials to the site on an as needed basis. Such materials and equipment shall be arranged in a neat and orderly manner, and away from pedestrian or automobile traffic. No interior storage shall be permitted. The storage area shall be barricaded by the Contractor to indicate that it is a restricted area.

F. Assume full responsibility for protection and safekeeping of materials and equipment stored at site. Move stored materials and equipment that interfere with the operations of the Owner.

G. Temporary Facilities and Controls: Refer to Section 01 50 00 – Temporary Facilities and Controls, for specific requirements. Contractor is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, and costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for the Contractors own activities.
3. Temporary protection of Owner's property during construction activities.
4. General hoisting facilities for contractor's construction activities.
5. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
6. Progress cleaning of construction areas on a daily basis.
7. Secure lockup of its own tools, materials, and equipment.
8. Construction aids and miscellaneous services and facilities necessary exclusively for contractor's construction activities.

H. Restore property of the Owner to its original condition prior to the start of construction. Refer to "Final Cleaning" section of Section 01 77 00 – Closeout Procedures. General clean-up of the site shall be performed on a daily basis.

1.12 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to locations/areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated, unless required to complete the work.

1. Limits: Confine construction operations to locations shown on the drawings.
2. Keep roadways, streets, driveways, parking garages, loading areas, serving premises clear, unobstructed and available to Owner, Owner's employees, emergency responders and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
    c. Schedule deliveries to minimize the adverse effect on the Owner's day to day operations.

C. Access to the site is limited to authorized construction personnel with proper identification and clearances during scheduled hours.

D. Work outside of the primary construction area shall be scheduled with the Owner sufficiently in advance.

E. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off-site. Do not exceed allowable floor loading.

F. Take steps necessary to protect adjacent and existing facilities (infrastructure, real estate, equipment) and planting during the course of the project. Damage will be repaired, and restored to original condition by the Contractor.

1.13 OWNER FURNISHED CONTRACTOR-INSTALLED PRODUCTS

A. Owner's Responsibilities:

1. Arrange and pay for off-site warehousing of all products (products) and their delivery to the project site.

2. Submit claims for transportation damage to the products that are apparent upon delivery to warehouse and replace damaged, defective, or deficient items.

B. Contractor's Responsibilities:

1. Coordinate scheduling of all product/material deliveries from the warehouse in such manner that when deliveries arrive at the project site they are transported directly to where they will be installed.
2. Receive, unload and unpack products at site; inspect for completeness or damage.
3. Submit claims for damaged products and replace damaged, defective, or deficient items.
4. Arrange for manufacturers' warranties, inspections, and service.
5. Review Owner provided shop drawings, product data, and samples.
6. Provide Owner with field verified “take offs” for all owner provided materials. These take offs shall not be determined by scaling or taking measurements from the contract drawings.
7. Handle and install all Owner supplied products.
8. Protect all Owner provided products before, during and after installation. Repair or replace items damaged at any of these stages.
9. Each pertinent subcontractor shall have a representative on site during Owner’s move-in and equipment installation to handle any problems that may be encountered.
10. Solid wood blocking shall be provided for all wall mounted accessories.
11. Contractor shall allow the Owner's vendors for equipment, phones, computers, cable TV and security systems, etc. into the building to pre-install any in-wall rough-ins and to perform final installations of their respective systems.
12. Contractor shall provide coordination for same and notify Owner in sufficient time for Owner to schedule the respective vendors' installations.

C. Each pertinent subcontractor shall have a representative on site during Owner’s move-in and equipment installation to handle any problems that may be encountered.

1.14 MISCELLANEOUS PROVISIONS

A. Furnish, install, maintain, relocate, and remove construction fences, signs, barricades, cones, warning lights, and other safety control devices and temporary signage required for the proper execution of the project. Review the safety control device placement before work begins and also prior to the beginning of work on subsequent construction stages. Deficiencies in the location or arrangement of devices shall be corrected by the Contractor before starting work.

1.15 SPECIFICATION FORMATS AND CONVENTIONS

A. Project Manual: The Project Manual comprises written documents for the Work in one or more volumes that include Specifications issued under the professional seals of the Architect and its consultants, and documents prepared by the Owner or other entities for which the Architect has no responsibility. The Project Manual may contain documents such as bidding requirements and information available to bidders that are not Contract Documents.

B. Specification Format: The Specifications are organized into Divisions and Sections using the ***MASTERFORMAT*** **™ 2020 Edition** numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; based on the types of work required for this project. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
2. The complete ***MASTERFORMAT*** **™ 2020 Edition** is available on-line at https://www.csiresources.org/standards/masterformat

C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative

or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
4. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
5. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials, products and equipment identified on Drawings are described in detail in the Project Manual. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products may be identified by keynotes referencing work within the Specification Section identified in this Project Manual.
4. General Notes: Notes that apply to the entire work. As such, general notes apply equally to all disciplines and to all sheets within the drawing set.
5. Coded Notes: Notes that apply to the specific discipline on the drawing sheets in which these notes appear.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Related Sections:

1. Drawings and general provisions of the Contract, General Conditions, Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
2. Document 00 41 13 – Bid Form
3. Section 01 26 00 – Contract Modification Procedures: Procedures for submitting and handling Change Orders.
4. Section 01 29 00 – Payment Procedures: Procedures for submitting requests for payment.
5. Individual technical Sections for description of work for allowances indicated.

1.02 DEFINITION

A. An allowance is a monetary amount or a quantity which is not otherwise defined by the Contract Documents, but which is included as part of the Contract Sum.

1. A quantity allowance requires a specified quantity of a product to be included in the Contract Sum, even though the location of the product is not defined in the Contract Documents. In the event greater or lesser quantities of materials are required than the quantity listed in this Section, the Contract Sum will be adjusted by Change Order.
2. A cash allowance is a monetary amount which is included as part of the Contract Sum, to cover the cost of items to be determined at a later time.

1.03 DESCRIPTION OF REQUIREMENTS

A. Include in the contract sum all allowances stated in the Contract Documents.

B. Requirements of the work related to each allowance are specified in the Contract Documents.

C. When requested by the Architect, obtain and submit proposals for the work of each allowance for use in making final selections; include recommendations for selections which are relevant to the proper performance of the work.

D. Designate in the Schedule of Values the quantities of materials required under each allowance.

E. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.

1.04 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

D. Arrange for and process Samples, Shop Drawings, and Product Data. Make arrangements for delivery and installation.

1.05 COORDINATION

A. General: Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.

1.06 MEASUREMENT AND PAYMENT OF ALLOWANCES

A. Include in the Contract Sum a stipulated sum for the quantity of materials indicated for use upon the Architect's instruction.

B. Cost Included in Allowances: Include the following costs in allowances:

1. Allowances shall cover the cost to the Contractor of specific products and materials under allowance, delivered to the Project site and all applicable taxes.
2. Contractor's costs for unloading and handling on the Project site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the allowance.
3. The amount of the allowance includes furnishing and installing the products in accordance with the requirements of referenced specification section.

C. Change Order Data: Where applicable, include in each change order proposal both the quantities of products being purchased and unit costs, along with total amount of purchases to be made. Where requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts. Comply with provisions of General Conditions for Change Order mark-up.

D. Lump Sum Allowances: Each change order amount for an lump sum allowance shall be based solely on the difference between the actual unit purchase amount and the lump sum allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.

1. Include installation costs in the purchase amount only where indicated as a part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins as claimed.

E. Excess Materials: Submit invoices or delivery slips to indicate actual quantities of materials delivered to site for use in fulfillment of each allowance.

1. Where economically feasible, and when so requested by the Architect, return unused materials to the manufacturer/supplier for credit to the Owner, after the installation has been completed and accepted.
2. Where it is not economically feasible to return unused material for credit and when so requested by the Architect, prepare unused material for the Owner's storage, and deliver to the Owner's storage space as directed. Otherwise, disposal of excess material is the Contractors' responsibility.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES

A. ALLOWANCE 1: SLATE TILE BREAKAGE REPLACEMENT

1. Include a cash allowance of ten-thousand dollars ($10,000) for slate roofing tile as replacement tile for tile broken during salvage or existing tile unusable as salvaged tile.
2. This amount is additional to the work shown in the contract documents as Base Bid Work and is included on the Bid Form.
3. Unused portions of this allowance will be deducted from the Contract Sum at the completion of the project, and returned to the Owner.
4. Specification Reference: Section 07 31 26 – Slate Roofing Shingles.

B. ALLOWANCE 3: RECLAIMED TIMBER BEAMS

1. Include a cash allowance of five thousand dollars ($5000) for purchase of reclaimed timber beams.
2. This amount is for purchase of new (reclaimed) timber beams for use in the new addition ceiling noted as “Decorative Beams – Reclaimed Barn Wood” on the drawings and is to be used if salvaged framing from the barn main floor deck cannot be salvaged in adequate quantity or dimension for reuse as structural beams.
3. This amount is included on the Bid Form.
4. Unused portions of this allowance will be deducted from the Contract Sum at the completion of the project, and returned to the Owner.
5. Specification Reference: Section 06 05 00 – Reclaimed Timber Beams.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1. Provide price for each alternate on the Bid Form. Include cost of modifications to other work to accommodate each alternate. Include related costs such as overhead and profit.
2. Alternates are described briefly in this section. The Contract Documents also define the requirements for alternates.
3. Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each alternate and to provide the complete construction required by Contract Documents.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 DEFINITION

A. An alternate is an amount proposed by Bidders and stated on the Bid Form that will be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either scope of Work or in products, materials, equipment, systems or installation methods described in Contract documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.03 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project. The cost listed for each alternate on the Bid Form shall include costs of related coordination, modification, or adjustment.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

1. Execute accepted alternates under the same conditions as other work of the Contract.
2. Alternates may be accepted out of sequence, in any order, at the sole discretion of the Owner.

C. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1. Only principal items of Work are highlighted in each mandatory alternate. Include as part of each alternate, miscellaneous devices, appurtenances, and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

1.04 COORDINATION

A. Coordinate related Work and modify or adjust adjacent work as required to ensure that Work affected by each accepted alternate is complete and fully integrated in to the project.

B. Immediately following Contract award, prepare and distribute to each party involved, notification of the status of the Alternate, indicating whether alternate has been accepted, rejected, or deferred for consideration at a later date.

1.05 DESCRIPTION OF REQUIREMENTS

A. This section identifies alternate by number and describes the basic changes to be incorporated into the work, only when that alternate is made a part of the Work by specific provisions in the Contract.

B. Referenced sections of specifications stipulate pertinent requirements for products and methods to achieve the work stipulated under the alternate.

C. Include all applicable alternates requested in the Bid Form.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 SCHEDULE OF ALTERNATES

(Alternate numbers reference Items shown on the Bid Form)

A. ALTERNATE #1 – GRAVEL PATIO IN LIEU OF GRASS

1. Base Bid: Prepare area and provide top soil and grass preparation in area identified as patio area
2. Alternate Bid: Provide gravel as finish surface over aggregate base on compacted subgrade per sheet C106, Detail A.

B. ALTERNATE #2 – ASPHALT PARKING LOT IN LIEU OF GRAVEL

1. Base Bid: Gravel
2. Alternate Bid: Paved asphalt parking in lieu of gravel per Civil drawings.

C. ALTERNATE #3 – EXTENDED CONCRETE PATH AND STAIRS ON HILLSIDE

1. Base Bid: Concrete ramps with railings as indicated.
2. Alternate Bid: Provide increase length of concrete sidewalk to extend north and including a stair section as identified on Sheet C106 and reference details.

D. ALTERNATE #4 – CHANDELIER LIFTS IN EVENT SPACE

1. Base Bid: No lifts.
2. Alternate Bid: Provide chandelier-hoist product and wood panel cover at four (4) Event Space chandeliers, including support framing, wood enclosures and additional power required by the lifts.

E. ALTERNATE #5 – ZIP-R SHEATHING IN LIEU OF CAVITY BATT INSULATION IN NEW ADDITION

1. Base Bid: Exterior walls of new addition insulated with batt insulation in framing cavity including separate sheathing and air barrier.
2. Alternate Bid: Provide Zip-R sheathing as exterior wall insulation/sheathing in lieu of base bid components.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for substitutions. Acceptable reasons for substitution are limited to the following conditions:

B. Acceptable reasons for substitution are limited to the following conditions:

1. Product or material specified cannot be coordinated with other work.
2. Product or material specified is not acceptable to Authorities Having Jurisdiction (AHJ).
3. Substitution offers substantial advantage to the Owner in terms of cost, time, or other valuable consideration.

C. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General Conditions and Division 01 specification sections, apply to work of this section.
2. Section 01 60 00 – Product Requirements: Product options which authorize a substitution request form.
3. Individual Technical Sections: Expressed restrictions related to substitutions.

D. Attachments following this section:

1. Substitution Request Form (01 25 00A)

1.02 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents. Proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product or regulatory changes.
2. Substitutions for Convenience: Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to the Owner.

1.03 SUBSTITUTION PROCEDURES

A. Substitutions: Request for substitution must be in writing. Architect will review unsolicited substitutions in accordance with the Owner/Architect Agreement.

1. Where specification language does not specifically authorize substitutes, the Contractor shall use the specified product unless the Contractor can confirm a substitution is necessary for cause or convenience, as defined above, and provides a submittal, using a Substitution Request Form acceptable to the Architect, indicating all differences from the specified product.
2. The Architect can reject substitutions without cause.
3. Approval of Shop Drawings, product data, or samples is not a substitution approval unless clearly presented as a substitution with a Substitution Request Form attached at the time of submittal.
4. Specified products that require substitution due to product unavailability, construction schedule conflicts due to strikes, acts of nature, acts of war, or errors and omissions shall use a Substitution Request Form acceptable to the Architect. Indicate each difference from the specified product's requirements.
5. Architect must provide written approval for the substitution.

B. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

C. Unless code required, or formally requested by the authorities having jurisdiction, the Contractor shall refrain from proposing any substitution that does not represent for the Owner at least one or a combination of the following factors:

1. An increase in durability.
2. An improvement in performance.
3. A reduction in cost.
4. A reduction in the building's operational costs.
5. A reduction in the construction schedule.
6. An increase in the work warranty.

D. Substitutions shall not reduce the quality of the product, material, equipment and methods required by the Contractor Documents.

E. Substitution Requests: Submit PDF electronic copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include: attributes such as weight, size, visual effect, durability, performance, operation costs, warranty, sustainable design characteristics, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from a laboratory chosen from common agreement.
    j. If during the execution of the work, the Owner is in disagreement with the laboratory's testing, the Owner shall hold the right to hire a different laboratory and the Contractor shall be required to accept such test results and consequences.
    k. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time.
    l. Cost information, including a proposal of change, if any, in the Contract Sum. Contract's Unit prices shall be used as reference for cost analysis of any substitution.
    m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
    n. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify the Owner of its recommendation for acceptance or rejection of proposed substitution within ten (10) business days of receipt of request, or five (5) business days of receipt of additional information or documentation, whichever is later.

    a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Written Site Instructions for minor changes in the Work.
    b. Use product specified if Architect and the Owner do not issue a decision on use of a proposed substitution within time allocated.

F. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 30 days prior to time required for preparation and review of related submittals. The decision as to whether the substitution is acceptable is solely at the discretion of the Architect.

1. Conditions: Architect will consider Contractor's request for substitution and Contractor shall inform the Architect of his recommendations, when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
j. The communication of approval always shall be issued by the Architect subject to prior approval by the Owner. Approvals without the Owner acceptance will not be valid.

G. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect. The decision as to whether the substitution is acceptable is solely at the discretion of the Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution of material or product which requires substantial similarity in appearance and coordination with other finishes, will not require revisions to color palette as determined by the Architect.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
l. The communication of approval always shall be issued by the Architect subject to prior approval by the Owner. Approvals without the Owner's acceptance will not be valid.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Architect’s Process: Unless it is mutually agreed to utilize web-based Construction Contract Administration (CCA) software system for tracking and responding to communications between the Architect and the Contractor, documents will be transmitted as PDFs via email or FTP. Documents will be sent as PDF or other standard format (MS Word, Excel, JPEG, etc.) via email or the Architects FTP site.

1. Contractor shall prepare requests and submittals on electronic forms acceptable to Architect and Owner provided the data included is consistent with the Substitution Request Form included after the end of this Section.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

SECTION 01 25 00A

SUBSTITUTION REQUEST FORM

TO:	Schooley Caldwell	PROJECT:	**BICENTENNIAL BARN – MCCAMMON CREEK PARK**
	c/o Ms. Kalpa Baghasingh	SC Project No.	23070.00
	kbaghasingh@schooleycaldwell.com	Due Date:	March 6, 2025, at 5:00 p.m. (*refer to Section 01 25 00)*

A proposed substitution cannot legally be included in a bid or used in the Work until it appears in an Addendum or other Contract Modification as defined in the General Conditions. See "Invitation to Bid" and Section 01 60 00 – Product Requirements.

PROVIDE THE FOLLOWING INFORMATION. FAILURE TO PROVIDE THE INFORMATION COMPLETELY WILL BE CAUSE FOR REJECTION OF THE SUBSTITUTION.

SPECIFIED PRODUCT:

Specified Product: _____

Specified Manufacturer: _____

Specification Section: _____ Page: _____ Article: _____ Paragraph: _____

PROPOSED PRODUCT:

Product Name: _____

Manufacturer Name: _____

Manufacturer Web site: _____

QUESTIONS:

Answer the following questions using a separate attachment:

In your opinion, is the proposed product equivalent to the specified product?

Are the product characteristics the same as the specified product? (Dimensions, material properties?)

Are the product warranties the same? If not, list differences (Include attachment documenting warranty).

Does the proposed product require modifications to the building construction details?

Color: Is the same color available at no upcharge? Is another color selection required that doesn't match the specified product?

Will the construction time be affected if this proposed product is approved?

Has the proposed product been used locally?

Name of Facility: _____

Address: _____

Contact Person: _____ Phone: _____

Is product represented locally?

Supplier/Representative: _____ Phone: _____

Are approved installer(s) available locally?

Approved Installer(s): _____

Provide an attachment that lists a minimum of three similar projects completed by each installer. Include contact name and telephone number.

ATTACHMENTS:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other

Include the following attachments:

1. Copy of the Project Manual Section where the proposed equal product would be specified, rewritten or red-lined to include any changes necessary to correctly specify the proposed equal product. Identify completely changes necessary to the original Project Manual Section.
2. Copies of details, elevations, cross-sections, and other elements of the Construction Drawings redone as necessary to show changes necessary to accommodate proposed equal product. Identify completely the changes from the original Drawings.
3. Complete product literature and technical data, installation and maintenance instructions, test results, and other information required to show complete conformance with requirements of the Contract Documents.

CERTIFICATION:
Signature on this document provides that the proposer certifies that the following statement and accompanying attachments are true:

1. Substitute product has been fully investigated and determined to be equal or superior in all respects to the specified product performance.
2. Same warranty will be furnished for proposed substitution product as for specified product.
3. Same maintenance service and source of replacement parts, as applicable, is available.
4. Proposed equal product will have no effect on other trades and will not affect or delay progress schedule.
5. Proposed equal product does not affect dimensions and functional performance values.
6. Payment will be made to the Architect for changes to building design, including Architect design, detailing, and construction costs caused by the substitution.
7. The undersigned further states that the function, appearance, and quality of the proposed product are equivalent or superior to the specified item:

Submitted by: _____

Signature: _____

Typed Name: _____

Company: _____

Address: _____

_____ Zip Code: _____

Telephone: _____ Fax: _____

Attachments (List): _____

ARCHITECT REVIEW AND ACTION: (For use of the Architect only)

_____ Proposed product accepted.
_____ Proposed product not in compliance with instructions. Respond to attached comments and resubmit.
_____ Proposed product not acceptable. Use specified product(s).
_____ Not Reviewed. Submission received too late. Use specified product(s).

ADDITIONAL REVIEWER COMMENTS: (For use of the Architect only)

_____

_____

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes specific administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Section 01 60 00 – Product Requirements for administrative procedures for handling requests for substitutions made after Contract award.
2. Document 00 72 13 – General Conditions, (AIA Document A201) Article 7 – Changes in the Work.

1.02 MINOR CHANGES IN THE WORK

A. The Architect will issue Supplemental Instructions, authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

B. Per Article 7 of the AIA General Conditions, the Architect will issue through supplemental instructions, authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Architect's Process: Unless it is mutually agreed to utilize web-based Construction Contract Administration (CCA) software system for tracking and responding to communications between the Architect and the Contractor, documents will be transmitted as PDFs via email or FTP. Documents will be sent as PDF or other standard format (MS Word, Excel, JPEG, etc.) via email or the Architects FTP site.

1. Contractor shall prepare requests and submittals on electronic forms acceptable to Architect and Owner provided the data included is consistent with the Request for Substitution form included at the end of this Section.

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time or on date specified in the bulletin, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. No lump sum amounts are permitted. Detailed breakdown of costs are required, broken down by labor and materials, etc.; and including prime, subcontractor, sub-subcontractor and/or supplier pricings.
    c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Use electronic form acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 – Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.
7. Use electronic form acceptable to Architect.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Request for Proposal, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
2. To expedite decisions about changes, Contractor is strongly encouraged to use digital photographs or still photographs to transmit information about existing conditions to the Architect’s office.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 26 13

REQUESTS FOR INFORMATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Requests for Information.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General Conditions and Division 01 specification sections, apply to work of this section.

1.02 DEFINITIONS

A. Definitions used in this article are not intended to change or modify the meaning of other terms in the Contract Documents.

B. Request for Information (RFI): A request for information by the Contractor to the Architect for clarification of intent of any portion of the Contract Documents after the award of Contract and during the construction phase of the Project.

C. The following are NOT Requests for Information:

1. Change Orders.
2. Substitution Request.
3. Bulletin.
4. Field Order.
5. Shop Drawings.
6. Normal questions contained in a typical shop drawing submittal.
7. Clarifications during bidding.

1.03 NON-RESPONSIVE RFI'S

A. Do not transmit request for interpretation when other form of communication is appropriate, such as Submittals, requests for approvals of substitutes, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action by the Architect.

B. Do not submit request for interpretation or clarification when:

1. Answer may be obtained by observations at the Site; or.
2. Required information is clearly indicated in the Contract Documents; or.
3. Required information is included in industry standards referenced in the Contract Documents or Supplier's instructions that are consistent with the Contract Documents; or.
4. Is reasonably inferable from any of foregoing.

C. Architect will return requests for interpretation without response for any of the following reasons:

1. Request is regarding one of the items addressed in Paragraphs in Paragraph A of this article.
2. Request is unclear or incomplete.
3. Request was answered in Architect's response to a prior request for interpretation.
4. Request is related to construction means, methods, techniques, procedures, or sequences of construction that are not required by the Contract Documents.
5. Request is related to safety and protection matters that are solely Contractor's responsibility.
6. Request resulted in whole or in part due to lack of adequate coordination by Contractor, including coordination of Subcontractors and Suppliers.
7. Requests that are otherwise frivolous or unnecessary.

1.04 REQUESTS FOR INTERPRETATION (RFI'S) DURING CONSTRUCTION

A. RFI's are logged-in at the Architect's Office, not necessarily with same date as indicated by the Contractor on RFI form. The response time will commence upon the date of receipt by the Architect.

1. Copies of RFI's sent by the Contractor and received by the Architect after 2:00 p.m. will be considered received the following Monday, holidays excepted at 8:00 a.m. and are to be dated as such.

B. Submit a copy of the format to the Architect at start of Project for review and comment.

C. Requests for Information (RFI): If clarification of any portion of Construction Documents is required, submit a Request for Information to the Architect in accordance with the following procedures:

1. RFI Format:

a. Submit on a standard form developed by the Architect.
b. RFI's shall be sequentially numbered; and include the following:

1) Project name.
2) Project number.
3) Date.
4) Name of Contractor.
5) Name of Architect.
6) RFI number, numbered sequentially.
7) RFI subject.
8) Specification Section number and title and related paragraphs, as appropriate.
9) Drawing number and detail references, as appropriate.
10) Field dimensions and conditions, as appropriate.
11) Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12) Contractor's signature.
13) Adequate space for Architect to respond, sign, and date.
14) Attachments: Include sketches, descriptions, measurements, photos, Product Data, and other information necessary to fully describe items needing interpretation.

a) Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
b) Attachments shall be electronic files in Adobe Acrobat PDF format.

D. RFI Procedure:

1. Clearly state and completely define the issue requiring interpretation.
2. Each RFI shall address one subject or issue.
1. Each RFI shall contain specific reference to the drawing number(s), detail number(s), schedule type(s), bulletin number(s), specification section(s) and paragraph number(s), or other related document(s) which is (are) pertinent to the Contractor's question. The date of each referenced drawing number, bulletin, specification section, or other related document shall be identified. In preparing each RFI verify the applicable dimension(s), field conditions, drawing requirements (small through large-scale details), and/or specification section requirements pertaining thereto.
2. Prior to submission of an RFI coordinate the nature of the inquiry with the requirements of other sections or trades as related thereto, as well as responses to previous RFI's. Where supplementary sketches are required to clarify an inquiry the Contractor shall attach supplementary sketches, at large scale, illustrative of the inquiry. Sketches shall include sufficient detail, materials, dimensions, thicknesses, assembly, attachments, relation to adjoining work, structural grid references, and all other pertinent data and information for the Architect to make an informed response.

a. The Contractor is encouraged to suggest solution(s) to its inquiries, if applicable.
a. Should the Contractor's solution(s) have an impact on Contract Sum or Contract Time it shall be so stated within the RFI. Provide cost and schedule implications, if any.

3. Ambiguous RFI's will be returned to Contractor without action taken.

E. RFI Submission Process:

1. Submit an RFI, in writing, to the Architect immediately when any issue requiring clarification arises.

a. Unless specifically stated on RFI, the Architect will assume adjustments to the Contract Amount and the Project Schedule are NOT REQUIRED.

2. The Architect will review and respond only to RFI's received in writing from the General Contractor.
3. Submit electronic copies of each RFI and Architect response, including any supplemental drawings and additional instructions, to the Architect for record purposes.
4. RFI's submitted to the Architect of without following these submission procedures will result in rejection of the submission.

F. RFI Log:

1. Maintain an RFI log indicating the RFI number, subject, date, response date and impact, if any on schedule and cost.
2. Publish the log at least bi-monthly to the Architect.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contractor's applications for payment.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General Conditions and Division 01 specification sections, apply to work of this section.

1.02 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.03 SCHEDULE OF VALUES

A. Coordinate preparation of Schedule of Values with preparation of Construction Schedule.

1. Prepare Schedule of Values, typed, on AIA Form G703 – Application and Certificate for Payment Continuation Sheet.
2. Correlate line items in schedule of values with other required administrative schedules and forms including:

    a. Construction schedule.
    b. Application for payment form.
    c. List of subcontractors.
    d. List of products.
    e. List of principal suppliers and fabricators.
    f. Schedule of submittals.

3. Submit Schedule of Values to Contractor within 7 days after contract award.

    a. Schedule of Values shall be approved by the Contractor prior to initial application.

4. Submit schedule of values to Owner/Architect at the earliest feasible date, but in no case later than 30 days before the date scheduled for submittal of initial application for payment.
5. Provide separate schedule of values for each phase of the Project.

B. Format and Content: Use the Project Manual table of contents format (specification section numbers and names) to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.

f. Change Orders (numbers) that affect value.
g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.
2) Materials.
3) Equipment.

3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

5. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.04 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Contractor shall submit application for payment at regularly scheduled pay meetings as established at the Pre-Construction Conference. The period covered by each Application for Payment shall be clarified at the Pre-Construction Conference.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703, or other form approved by the Owner, as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

F. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

G. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

H. Provide summary documentation for stored materials indicating the following:

1. Materials previously stored and included in previous Applications for Payment.
2. Work completed for this Application utilizing previously stored materials.
3. Additional materials stored with this Application.
4. Total materials remaining stored, including materials with this Application.

I. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor’s construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.

K. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

L. Final Payment Request: Submit final Payment Request per ¶9.7 of the General Conditions:

1.05 RECOMMENDATION FOR PAYMENT BY THE ARCHITECT

A. Issuance of Recommendation For Payment by the Architect, constitutes a representation by the Architect to the Owner, based on his observations at the Project Site, as provided in the Owner- Architect Agreement, and data comprising the Application For Payment, the Work has progressed to the point indicated; to the best of his knowledge, information and belief, the quality of Work is in accordance with the Contract Documents (subject to evaluation of the Work for conformance with the Contract Documents upon substantial completion, to the results of any subsequent test required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in this certificate); and the Contractor is entitled to payment in the amount recommended.

B. However, by issuing a Certificate of Payment, the Architect shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality of Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or has made any

examination to ascertain or for what purpose the Contractor has used monies previously paid on account of the Contract sum.

C. A recommendation for payment or a progress payment does not constitute acceptance of Work in accordance with Contract Documents.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 31 00

PROJECT COORDINATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Project coordination
3. Project meetings and conferences
4. Administrative and supervisory personnel.
5. Digital Project Management Procedures
6. Coordination drawings.

B. Each subcontractor shall participate in coordination requirements. Although certain areas of responsibility may be assigned by contract to a specific subcontractor, the Contractor shall be responsible for the overall coordination of all the work.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Drawings and general provisions of the Contract, including General Conditions and Division 01 specification sections, apply to work of this section.

   a. Article 4 Construction Phase Coordination of the General Conditions

2. Section 01 11 00 – Summary of Work.
3. Section 01 26 13 – Requests for Interpretation (RFI)
4. Section 01 33 00 – Submittal Procedures: For preparing and submitting Contractor's construction schedule.
5. Section 01 73 00 – Execution: For procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
6. Section 01 77 00 – Closeout Procedures: For coordinating closeout of the Contract.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Architect’s Process: Unless it is mutually agreed to utilize web-based Construction Contract Administration (CCA) software system for tracking and responding to communications between the Architect and the Contractor, documents will be transmitted as PDFs via email or FTP. Documents will be sent as PDF or other standard format (MS Word, Excel, JPEG, etc.) via email or the Architects FTP site.

1. Prepare requests and submittals on electronic forms acceptable to Architect and Owner.

1.03 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Arrange pipes, ducts, conduits, and other overhead systems in an orderly manner when indicated to remain exposed.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner's Representative and sub-contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate location of fixtures and outlets with finish elements. Bring unconcealed conditions indicated to the attention of the Architect for confirmation of intent.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.04 PROJECT COORDINATION

A. Coordinate work of subcontractors including that related to:

1. Temporary facilities and controls.
2. Work specified in Divisions 02 through 49 of the specifications.

B. Coordinate schedules of subcontractors and material suppliers as required to:

1. Verify timely deliveries and materials and products for installation by other subcontractors.
2. Verify labor and materials are adequate to maintain schedules.

C. Conduct conferences with subcontractors and other concerned parties as necessary to:

1. Maintain coordination and schedules.
2. Resolve matters in dispute.

D. Participate in project meetings to ensure coordination and to:

1. Report on progress of work.
2. Recommend needed changes in schedules.

E. Coordinate temporary facilities and controls as required to:

1. Verify installation, operation and maintenance complies with governing codes and regulations.
2. Verify adequacy of facilities and controls for construction activities and operations.

F. Coordinate submittals. Review for compliance with requirements of Contract Documents prior to submitting.

1. Verify field dimensions and clearances.
2. Verify relation to available space.
3. Verify settings of anchorages including anchor bolts.
4. Review effects of changes in work with subcontracts and other contracts.
5. Verify compatibility of equipment with work of other subcontracts.
6. Verify motor voltages and control characteristics.
7. Coordinate controls and interlocks to verify voltages and phase, and wiring of pneumatic electric switches and relays.

G. Prepare coordination drawings as required to assure coordination of work and to resolve conflicts prior to installation.

H. Observe required testing, maintain records of tests and record:

1. Testing agency and name of inspector.
2. Subcontract work being tested.

3. Representatives present.
4. Date and time of testing.
5. Type of products or work being tested.
6. Types of tests and results.
7. Any retesting required.

I. Verify subcontractors are maintaining accurate project as-built documents.

J. Review proposals and requests for substitutions, modifications and changes.

1. Verify compliance with requirements.
2. Verify compatibility with work and equipment of other subcontracts.
3. Recommend action.

K. Verify work complies with requirements of Contract Documents.

1. Maintain record of observed deficiencies and discrepancies.
2. Promptly report deficiencies and discrepancies to Architect.

L. Assemble documentation associated with any claims or disputes.

M. Attend equipment start-up:

1. Verify services and connections are complete and equipment is in operable condition.
2. Observe testing, adjusting and balancing.
3. Record results including time and date of start-up.

N. Coordinate inspection and acceptance of equipment.

1. Prior to inspection, verify equipment is clean, tested and operational.
2. Assist inspector and prepare list of items to be completed or corrected.
3. Should acceptance and operation of equipment constitute the beginning of any specified guarantee period, prepare and transmit written notice.

O. Coordinate inspection and acceptance of work.

1. Prior to inspection verify work is complete and ready for acceptance.
2. Assist inspector and prepare list of items to be completed or corrected.
3. Should acceptance of work constitute the beginning of any specified guarantee period, prepare and transmit written notice.

P. Assemble project as-built documents.

Q. Submit copies of lists, tests and operating logs to Architect.

1.05 REQUESTS FOR INTERPRETATION/INFORMATION (RFIS)

A. Section 01 26 13.

1.06 PROJECT MEETINGS AND CONFERENCES

A. The General Contractor shall schedule job progress meetings with major subcontractors and shall notify the Architect of the time and place of the meeting. Subsequent meetings shall be held on the same day and hour of the week for the duration of the construction period; except, upon instructions of the Architect, the scheduled meetings may be increased or decreased as required by the progress of the work.

B. Progress Meetings: General Contractor shall conduct meetings at weekly intervals. Project meetings are in addition to specific meetings held for other purposes, such as pre-installation conferences. Notes shall be taken by the Architect on discussions and decisions made at each meeting. Typed copies of the notes shall be distributed by the Contractor to all concerned parties.

1. Attendees: In addition to representatives of the Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether contract is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Agenda: Discuss items of significance that could affect progress, including the following:

        1) Review, edit and approve minutes of the previous progress meeting.
        2) Review items of significance that could affect progress including any issues needing Owner and/or Architect action to prevent delays.
        3) Include topics for discussion as appropriate to the status of the Project.
        4) Review Work progress, since the last meeting, compared against the latest approved Construction Schedule. Determine status of each current and near-future activity on the schedule to determine whether it is on time, ahead of schedule, or behind schedule. Pay especial attention to Critical Path items. Include Procurement activities (including fabrication and delivery dates) in the review.
        5) Corrective measures and procedures required to maintain Construction Schedule, if activities are behind schedule.
        6) Work scheduled for succeeding construction period (usually two weeks)
        7) Field observations and problems with proposed solutions. Review Contract deficiencies with regards to quality, safety, manpower, supervision, etc. Include report by Quality Control Manager.
        8) Status of Submittals (current log to be provided by Contractor).
        9) Status of Proposed Changes to the Work (current log to be provided by Contractor)
        10) Status of Requests for Information (current log to be proved by Contractor)
        11) Review of preliminary payment requests (as appropriate).
        12) Site Walk-through of the in-progress Work including site review of issues discussed during progress meeting. Walk-throughs shall be attended by, at a minimum: Contractor Superintendent, Contractor Project Manager, Architect and Owner.

C. Preconstruction Conference: The Architect/Owner will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner's Representative, Contractor and Architect, but no later than three (3) days after Notice to Proceed.

1. Attendees: Owner, Owner's Representative, Architect, and their consultants; Contractor and its project manager, superintendent; Quality Control Manager, major subcontractors; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Construction schedule.
    b. Project phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of responsible personnel and their duties.
    e. List of Subcontractors.
    f. Submittal procedures.
    g. Procedures for processing field decisions and Change Orders.
    h. Procedures for RFIs.
    i. Coordination with testing and inspection agencies.
    j. Procedures for processing Applications for Payment.
    k. Distribution of the Contract Documents.
    l. Preparation of as-built documents.
    m. Use of the premises
    n. Work restrictions.
    o. Working hours.

p. Parking availability.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. Safety and first aid.
y. Security.
z. Housekeeping (cleaning) procedures.

3. Minutes: Contractor is responsible for conducting meeting and recording and distributing meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

D. Special Inspections Conference:

1. In accordance with the, Building Permit, and the requirements of the Authority Having Jurisdiction, a conference(s) will be conducted to review the procedures and work required under the Special Inspections Program.
2. Suggested Agenda:

a. Discuss the State’s requirements for Special Inspections.
b. Review proposed Inspection Plan.
c. Examine credentials of proposed inspection professionals and testing laboratories.
d. Reach an agreement on the Statement and the Schedule of Special Inspections.
e. Discuss detection and reporting of critical problems.
f. Discuss notification to the State of changes in critical services.
g. Review requirements for testing, inspection, observation, reports and certification by the different entities involved.

3. Attendance: The following shall attend the special inspections conference:

a. Architect.
b. Owner’s Representative.
c. Structural Engineer of Record.
d. General Contractor.
e. Special Inspector
f. Professional in charge of Architectural Inspections.
g. Geotechnical Inspector; Professional in charge of Geotechnical Services.
h. Professional in charge of Structural Inspections (if different from Special Inspector)
i. Professional in charge of Materials Testing Laboratory (if different from Special Inspector).
j. State Representative for Special Inspections.

E. Pre-installation Conferences: General Contractor shall conduct pre-installation conferences at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

1. Attendees: Owner’s construction representative, Contractor’s superintendent; Contractor’s quality control manager, installer (installing subcontractor); representatives of manufacturers and fabricators involved in or affected by the activity, supplier; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

a. Contract Documents.
b. Requirements for proper installation.
c. Related Change Orders.

d. Purchases and deliveries.
e. Deliveries
f. Approved submittals including Shop Drawings, Product Data and quality control Samples.
g. Review of mockups
h. Possible conflicts.
i. Possible conflicts and material compatibility problems.
j. Time schedules for activity, project schedule.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Acceptability of substrates.
o. Temporary facilities and controls.
p. Space and access limitations.
q. Regulations of authorities having jurisdiction.
r. Inspection and testing requirements.
s. Required performance results.
t. Recording requirements.
u. Protection of construction, adjacent work.

3. General Contractor: Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Promptly distribute meeting records to everyone concerned, including the Owner and Architect.
4. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

F. Coordination Meetings: Conduct Project coordination meetings for all parties (subcontractors, suppliers, etc.) involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: Representation at each meeting by every party (Contractor, subcontractor, supplier, etc.) currently involved in construction activities. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work
2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

G. Construction Quality Control Meetings: Conduct and attend meetings required by Section 01 45 00 – Quality Requirements.

H. Special Meetings: Attend special meetings when requested by the Owner at Project Site or Owner's office to discuss specific project concerns. Attendees shall include Contractor's project manager or Principal (as requested by the Owner) and any requested Subcontractor project manager or Principal (as requested by the Owner). All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

1.07 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to project manager, and project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work. Within 30 days of Notice-to-Proceed, submit to Architect and Owner's representative a list of principal Contractor staff assignments, including superintendent, project manager, and other supervisory personnel in attendance at Project site.

B. Identify individuals and their duties and responsibilities; mailing addresses, office telephone numbers, cell telephone numbers, fax numbers, and email addresses. Provide names, addresses, telephone numbers, fax numbers, and email addresses of individuals assigned as standbys in the absence of individuals assigned to Project.

C. Post copies of list in project meeting room, in Contractor's field office. Keep list current at all times.

1.08 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Web-Based Project Software: Provide, administer, and use web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project software site includes, at a minimum, the following features:
    a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Track status of each Project communication in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.
    l. Mobile device compatibility, including smartphones and tablets.
2. Provide up to seven web-based Project software user licenses for use of Owner's Representative, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
4. Provide one of the following web-based Project software packages under their current published licensing agreements:
    a. Autodesk; Buzzsaw or Constructware.
    b. Corecon Technologies, Inc.
    c. Meridian Systems; Prolog.
    d. Newforma, Inc.
    e. Procore Technologies, Inc.
    f. Viewpoint, Inc.; Viewpoint for Project Collaboration.
    g. Other web-based software as approved.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.09 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
e. Indicate required installation sequences.
f. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. General:

1. Submit required coordination drawings to Architect and Owner for record only within 60 days of Notice-to-Proceed. Coordination drawings are not shop drawings and will not be accepted or approved by the Architect or Owner.
2. Coordination drawings shall show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in space provided and/or to function as intended.
3. Except as otherwise specified, prepare composite coordination drawings to scale of 1/4"=1’-0" or larger; detailing major elements, components, and systems of utilities, architectural, structural, mechanical, and electrical elements, equipment and materials in relationship with each other. Include dimensions.
4. Provide coordination drawings utilizing different colors to illustrate work of separate trades or systems.
5. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to efficient flow of Work affecting one or more trades.
6. Indicate scheduling, sequencing, movement, and positioning of large equipment into building during construction.
7. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
8. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.
9. Show interrelationship of components to be shown on separate Shop Drawings.
10. Indicate required installation sequences.

C. Site Utilities: The coordination drawings shall include, but not be limited to, the following site utilities:

1. Water Distribution: Indicate pipe sizes, valve and meter locations, underground structures, connections, anchors, and reaction backing. Indicate spatial relationship between piping and other piping in same trench, and proximate structures.
2. Sanitary Sewerage: Indicate pipe sizes, manholes, locations and elevations, underground structures, and connections. Indicate spatial relationship between piping and other piping in same trench, and proximate structures.
3. Natural Gas Distribution: Indicate pipe sizes, valves, gas meters, and specialties. Include details of underground structures and piping. Show other piping in same trench and clearances from natural gas piping. Indicate interface and spatial relationship between piping and proximate structures.
4. Electrical and Communications: Indicate manholes and other structures, conduit and ductbank sizes, locations, and elevations. Include details of underground structures and connections. Indicate spatial relationship between conduit and other piping in same trench, and proximate structures.
5. Storm Drainage: Indicate pipe sizes, manholes and catch basins locations and elevations. Include details of underground structures and connections. Show other piping in the same trench and clearances from storm sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
6. Profile Drawings: Show system piping and conduits in elevation. Draw profiles at a horizontal scale of not less than 1 inch equals 50 feet and a vertical scale of not less than 1 inch equals 5 feet. Indicate pipe, conduit and underground structures. Show types, sizes, materials, and elevations of all crossing utilities on profile.

D. Structural Systems: Include but do not necessarily limit to the following:

1. Structural frame showing interface with exterior elements.
2. Location of openings in relation to structure.
3. Show attachments to decking, structural elements, and other systems.

E. Mechanical Systems: Include, but do not necessarily limit to, following:

1. Proposed locations of piping, ductwork, equipment, and materials.
2. Proposed locations for access panels and doors.
3. Clearances for installing and maintaining insulation.
4. Clearances for servicing and maintaining equipment, including coil removal, filter removal, and space for equipment disassembly required for periodic maintenance. Show access locations.
5. Equipment connections and support details.
6. Exterior wall and foundation penetrations.
7. Fire-rated wall and floor penetrations.
8. Sizes and location of required concrete pads and bases.
9. Valve stem movement.

F. Electrical Systems: Include, but do not necessarily limit to, following:

1. Proposed locations of major raceway systems, equipment, and materials.
2. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance. Show access locations.
3. Exterior wall and foundation penetrations.
4. Fire-rated wall and floor penetrations.
5. Equipment connections and support details.
6. Sizes and location of required concrete pads and bases.

G. Notify Architect of conflicts and other coordination issues requiring resolution prior to commencing construction in each affected area. Respond to Architect requests for information concerning the coordination drawings.

H. Transmit copies of final coordination to all interested parties including all concerned subcontractors. Keep a copy of all final coordination documents in the contractor's field office; make available for review and use by Architect and Owner during construction.

1.10 COORDINATION OF CEILING SPACE

A. Coordinate use of ceiling space in accordance with the submitted ceiling coordination drawings.

B. Above Ceiling Coordination:

1. Work by all above ceiling trades, especially work located by the Contractor (i.e. sprinkler pipes, conduit runs, etc.) must be carefully coordinated by the Contractor, prior to shop drawings submissions to assure that all work will fit in the space available.
2. The Contractor shall prepare above ceiling coordination drawings for all ceilings and all other ceiling space within 60 days of notice to proceed. The drawings should show all above ceiling work, and structure, with required clearances and dimensions shown. The drawing should also show exposed ceiling work. Drawings must locate all ductwork, pipes, and conduit. In preparing these drawings, verify structural conditions, and requirements of all above ceiling trades. All above ceiling work and exposed ceiling work must be fully coordinated by the Contractor, prior to submitting shop drawings for affected items.
3. Submit the coordination drawings to the Architect and Owner for record but not review. No additional compensation will be paid to correct work that does not fit in the space available, due to inadequate coordination by the Contractor, or that could have been resolved in the coordination drawing. Bring any discrepancies to the Architect attention for resolution at the time of submitting the coordination drawings.
4. The Contractor should hold a pre-installation meeting with all subcontractors involved in the above ceiling and exposed ceiling work. Review the coordination drawing requirements, plans, specifications, and proposed work sequencing and schedule. Resolve any problems or discrepancies prior to proceeding with the work.

C. Coordinate use of Project space and sequence of installation of plumbing, fire protection, mechanical and electrical Work. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due

allowance for available physical space; place runs parallel with building lines. Utilize space efficiency to maximize accessibility for other installations, maintenance, and repairs.

D. Layouts of plumbing, fire protection, mechanical, and electrical systems, equipment, fixtures, piping, ductwork, conduit, specialty items, and accessories indicated on Drawings are diagrammatic. Contractor shall make minor variations in alignment, elevation, and details required to avoid interference and to satisfy architectural and structural limitations

E. Prior to installation of material and equipment, review and coordinate Work with Architectural and Structural Drawings to establish exact space conditions. Where available space is inadequate or where reasonable modifications are not possible, request information from Architect before proceeding.

F. Coordinate installation to prevent conflicts and cooperate in making, without extra charge, reasonable modifications in layout as needed.

G. Provide clear access to control points, valves, strainers, control devices, and specialty items of every nature related to such systems and equipment to obtain maximum head room. Provide adequate clearances as necessary for operation and maintenance.

1.11 COORDINATION DRAWING SUBMITTALS

A. For each coordination drawing, Contractor shall submit his layout to the Architect for record purposes. These drawings shall be a composite drawing consisting of the contractor's layouts superimposed on the architectural and structural background drawings. The architectural and structural background drawings shall be screened 30 percent for clarity. Submit after the initial layout is complete of all trades.

B. With the initial layout submittal identify all deviations to the Contract Documents to avoid structures and other utilities to be fully coordinated. Identify all conflicts and obtain solutions to conflicts from subcontractors and then incorporate them into the final layout submittal.

C. Make a final layout submittal following the same requirements described in the initial layout submittal above.

D. Schedule Coordination Shop Drawings preparation and submittals very early in the Project Schedule so any conflicts can be resolved.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule with cash flow forecast.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.
8. Field Report Responses
9. Special Inspector’s Report Responses, if required

B. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.

1.02 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. Event: The starting or ending point of an activity.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

E. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.03 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.

2. Electronic file of Field Report where indicated.
3. One paper copy to the Owner and one to the Architect, unless noted otherwise.

B. Contractor's Startup Construction Schedule: Prior to the first Application for Payment, submit an initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label. “Project Name: _____” “Date: _____” “Owner’s Project Number: _____”

C. Contractor’s Construction Schedule: Prior to the submission of the second Application for Payment, submit 3 opaque copies of the construction schedule, large enough to show the entire schedule for the duration of the project. Provide monthly updates thereafter to coincide with subsequent Applications for Payment.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Cash Flow Report that is updated monthly.

F. Special Reports: Submit two (2) copies at time of unusual event.

G. Field Report Responses: Submit electronically in excel format in the space provided on form provided in the Forms Section.

1.04 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy, if applicable.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.05 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 – PRODUCTS

2.01 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Owner.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 – Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than ten (10) days for completion of punch list items and final completion.
7. Include dates for inspections by Authorities Having Jurisdiction.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 – Summary of Work. Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Commissioning
    n. Startup and placement into final use and operation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.

d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.
g. Final Completion

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 01 29 00 – Payment Procedures for cost reporting and payment procedures.
2. Each Activity cost shall reflect an accurate value subject to approval by Owner.
3. Total cost assigned to activities shall equal the total Contract Sum.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is seven (7) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use one of the we-based software programs indicated in Section 01 31 00 – Project Coordination.

2.02 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed, but prior to the first Application for Payment.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within fourteen (14) days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten (10**%)** percent increments within time bar.

2.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.

5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.
20. Visitors, including regulatory agencies.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.05 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence of an incident that resulted in bodily injury or property damage. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

2.06 FIELD REPORT RESPONSES

A. Within one week of receipt of Field Reports, provide Contractor’s written response to Owner and Architect. Respond in excel format in the space provided on the Field Report Form in the Forms Section.

2.07 SPECIAL INSPECTOR’S REPORT RESPONSES

A. Within one week of receipt of Special Inspector’s Reports provide Contractor’s written response to Special Inspector, Owner Architect. Respond in format as prescribed by the Special Inspector.

2.08 CASH FLOW REPORT

A. Submit Cash Flow Reports that are based upon the cost loaded schedule. Submit Cash Flow Reports concurrently with each Application for Payment. Cash Flow report shall reflect actual historical cost corresponding to previously approved Applications for Payment.

PART 3 – EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule before the last regularly scheduled progress meeting that precedes the submission of the Application for Payment

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.
4. Maintain original schedule and any subsequent updates as separate active files until project completion.
5. Schedule update shall show progress on activities as separate progress basis. Do not adjust/change proposed overall start or completion dates without consent of the Owner.
6. Contractor shall sign off on the base schedule and updates. By signing the schedule, the Contractor is committing the resources to follow the schedule. In signing the schedule, Contractor is not necessarily accepting the events or causes that have resulted in the updated schedule. If contractor refuses to sign the schedule, they shall submit an alternate schedule for all activities to the Owner and other prime contractors within 48 hours. Failure to sign the schedule and offer a viable alternative schedule shall result in the non-signatory contractor(s) being responsible for any schedule ramifications for delays to the Owner, and other contractors.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. When revisions are made, distribute updated schedules to the same parties. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – PRODUCTS

1.01 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Pre-construction photographs.
2. Periodic photographs.
3. Final completion photographs.

B. Related Requirements:

1. Section 01 33 00 – Submittal Procedures for submitting photographic documentation.
2. Section 01 77 00 – Closeout Procedures for submitting photographic documentation as project record documents at Project closeout.

1.02 QUALITY ASSURANCE

A. Engage a qualified photographer to take photographs during construction. Throughout the construction period, Contractor shall provide photographs that depict their intended subject clearly and in accordance with the requirements included herein.

B. Photographer's Qualifications: The photographer may either be outsourced or be a present staff member of the Contractor's staff who is capable of providing photographic images in accordance with the requirements included herein.

1.03 ACTION SUBMITTALS

A. Digital Images: Photographer shall submit a complete set of digital image electronic files to the Architect, meeting the prescribed format, quantity, and perspective, as described in Part 2 of this Section, within 7 calendar days after taking photograph. Identify electronic media with date photographs were taken.

B. Key Plan: Submit key plan of Project site and buildings with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

PART 2 – PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: JPEG format with minimum sensor size of 8 megapixels or higher and at an image resolution of not less than 3200 by 2400 pixels.

1. Un-cropped images must have the same aspect ratio as the sensor.
2. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect and Owner.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Unique sequential identifier keyed to accompanying key plan.

2.02 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 3 – EXECUTION

3.01 COOPERATION WITH PHOTOGRAPHER

A. Contractor shall cooperate with the photographer's work, including providing auxiliary services as requested, access to the project site, and use of temporary lighting and other facilities.

3.02 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Owner.

C. Pre-construction Photographs: Before commencement of construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take minimum of 20 photographs weekly, with timing each month adjusted to coincide with completion of work to that date. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

1. Do not include date stamp.

F. Additional Photographs: Architect and Owner may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

    a. Special events planned at Project site.
    b. Immediate follow-up when on-site events result in damage or losses.
    c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
    d. Substantial Completion of a major phase or component of the Work.
    e. Extra record photographs at time of final acceptance.
    f. Owner's request for special publicity photographs.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for submittals required for performance of the Work which consist of the following: Contractor's Construction Schedule, schedule of values, product list, shop drawings, product data, samples, manufacturer's instructions and manufacturer's certificates.

B. Related Sections:

1. Refer to other Division 01 sections and other Contract Documents for specifications on administrative, non-work related submittals. Such submittals include, but are not limited to the following items:

   a. Submittal Registry of all required submittals
   b. Contractors Construction Schedule
   c. List of Subcontractors.
   d. Schedule of Values
   e. Schedule of Materials and Equipment
   f. Certificate of Insurance and Worker's Compensation Certificate.
   g. Application for payment.
   h. Permits.
   i. Inspection certificates and test reports.
   j. Items required to be submitted prior to final payment and release of retainage.

2. Section 01 77 00 – Closeout Procedures: Requirements for closeout submittals.

1.02 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.03 ELECTRONIC SUBMITTAL PROCEDURES

A. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Transmittal Form for Electronic Submittals: Use electronic form provided by or approved by the Architect.

B. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. If established for the project, post electronic submittals as PDF electronic files directly to Architect's FTP site. Notify Architect in email when submittals are posted to the FTP site.
3. All submittals are to be submitted electronically except for samples, color charts, and small mockups.

1.04 GENERAL SUBMITTAL PROCEDURES

A. Coordinate preparation and processing of submittals with performance of construction activities. To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity. Shop drawing and product data submittals are not required for specific products named in the specification as approved products or “Standards” unless otherwise specifically required in a specifications section.

C. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Architect will withhold action on a submittal requiring coordination with other submittals until all related submittals are received. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

D. Prepare each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using the established transmittal form. The Architect will not accept submittals received from sources other than the Contractor.

E. Each submittal shall include (1) electronic Submittal Cover Sheet. The Submittal Cover Sheet does not replace the required use of transmittals. The Architect will furnish each Contractor an electronic file of the required Submittal Cover Sheet. All submittals including product data and certifications, color charts, shop drawings, samples, and mock-ups each require a Submittal Cover Sheet.

1. The following will be included on the Submittal Cover Sheet provided by the Architect: Contractor’s name and Project title, the Contractor’s and Architect’s submittal stamps.
2. Electronically enter the following on the Submittal Cover Sheet.

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Architect’s project number
    e. Submittal Number. Submittals are to be numbered consecutively. The Architect will provide numbering instruction at the time the electronic file is forwarded to the contractor. If re-submittals are necessary, the original submittal number is used along with the suffix R1, R2, etc.
    f. Name of Contractor/ Subcontractor/ Supplier
    g. Name of firm or entity that prepared submittal.
    h. Category and type of submittal.
    i. Specification Section number and title.
    j. Specification section, article and paragraph reference; Drawing reference number and detail references, as appropriate.
    k. Item(s) Submitted. Provide specific information. (Example: Product data for all plumbing fixtures with the exception of fixture supports).
    l. Location(s) where product is to be installed, as appropriate.
    m. Indication of full or partial submittal.
    n. Additional Information or Proposed Deviation: The Contractor is required to specifically identify a proposed deviation contained in a submittal. (Example: Scheduled product is discontinued. Product submitted is the current model #.)
    o. Other necessary identification.

F. Additional requirements for submittals are:

1. The Contractors markings on the submittals shall be made in the color green. This does not apply to information on the cover sheet.
2. Submittals that are marked by the Architect as “Not Approved” or “Revise and Resubmit” will be returned to the Contractor. Revise and resubmit submittals as required; identify all changes made since previous submittal.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
4. In addition to the above, clearly indicate the following:

    a. Relation to adjacent structure or materials.
    b. Field dimensions, clearly identified as such.
    c. Product or material conformance with applicable standards, such as ASTM standard or Federal Specification.

5. Give 5 working days’ notice to Architect for delivery of shop drawings.
6. Allow fifteen (15) working days for review by the Architect. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

G. Transmit under a separate cover sheet each material, product, equipment or assembly required in a specification section. Submittals grouping two or more types of unrelated systems or assemblies or submittals from more than a single specification section will not be reviewed and will be returned to the Contractor. Sequentially number the transmittal forms. Re-submittals to have original number with an alphabetic suffix.

H. Apply Contractor's stamp, signed or initialed, certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information are in accordance with the requirements of the Contract Documents.

I. Schedule submittals to expedite the Project and deliver to Architect at business address. Coordinate submission of related items.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.05 SUBMITTAL TYPES

A. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

B. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

C. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

D. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

E. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

F. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

G. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

H. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

I. Maintenance Data: Comply with requirements specified.

1.06 AFFIXING REVIEW STAMP

A. Separate Line Items: Affix an image of the Review Stamp to each separately-reviewable item of the submittal package. For example:

1. On each separate Shop Drawing sheet, affix a Review Stamp image.
2. For each separate item appearing on a Contract Document schedule, affix a separate Review Stamp image. For example: lighting fixture; plumbing fixture.
3. For each separate type of a product identified for the specified item, affix a separate Review Stamp image. For example, glass type; masonry unit type; metal panel type.

B. When affixed, the Review Stamp shall not obscure information contained in the submittal.

C. Fill in name of Contractor and Contractor’s project or contract number, if not already entered on stamp.

D. In the section of the stamp titled "Contractor Action," fill in the following information:

1. Section number of the Specification Section for which the submittal is being made, and Paragraph number of specific submittal requirement within the Section. Do not include items from more than one Specification Section on one form.
2. Submittal number: Refer to Submittal Form Instructions for submittal numbering.
3. Item number as shown on the Submittal Form.
4. Date submitted by Contractor.
5. Mark to signify whether item is Shop Drawing, Product Data, or Sample, or, if ‘Other,’ enter descriptive words on the blank line.
6. Signature of authorized representative of the Contractor who has performed the Contractor's review and approval of the submittal item, and the date.

1.07 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule as part of the bid submittal. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Owner and additional time for handling and reviewing submittals required by those corrections. Coordinate dates of submittal with Architect. Architect will comment on multiple submittals occurring at the same time. Contractor shall make revisions per Architect’s comments.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's and Owner's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

B. Submittal Format: Submit a sample transmittal and template for each submittal type with standardized cover sheet to Owner for approval as part of the bid submittal.

1.08 SCHEDULE OF VALUES

A. Coordinate preparation of the schedule of values with preparation of the progress schedule.

B. Correlate line items in the schedule of values with other required administrative schedules and forms, including:

1. Contractor's Construction Schedule.
2. Application for payment form.
3. List of subcontractors.
4. Schedule of alternates.
5. List of products.
6. Schedule of submittals.

C. Submit the schedule of values to the Architect at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial application for payment.

D. Use the Project Manual Table of Contents as a guide to establish the format for the schedule of values. Include the following Project identification on the schedule of values:

1. Title of project and location.
2. Name of the Architect.
3. Project number.
4. Contractor's name and address.
5. Date of submittal.

E. Arrange the schedule of values in a tabular form with separate columns to indicate the following for each item listed:

1. Generic name.
2. Related specification section.
3. Change Orders (numbers) that have affected value.
4. Dollar value.
5. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.

F. Provide a breakdown of the Contact Sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Break principal subcontract amounts down into several line items. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.

G. For each part of the work where an application for payment may include materials or equipment purchased or fabricated and stored, but not yet installed, provide separated line items on the schedule of values for initial cost of the materials for each subsequent stage of completion and for total installed value of that part of the work.

H. Show line items for indirect costs and margins on actual costs only to the extent that such items will be listed individually in applications for payment. Each item on the schedule of values and applications for payment shall be complete including its total cost and proportionate share of the general overhead and profit margin.

I. Update and resubmit the Schedule of Values when Change Orders or construction change directives result to a change in the Contract Sum.

1.09 PROPOSED PRODUCT SCHEDULE

A. Within 10 days after execution of the Agreement, submit schedule of major products proposed for use. Prepare schedule in tabular form showing each product proposed for use in the Work. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate the product list with the list of proposed materials manufacturers.
2. Prepare the product schedule with information on each item tabulated under the following column headings:

    a. Related specifications section number.
    b. Generic name used in Contract Documents.
    c. Proprietary name, model number and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.

3. Provide a written explanation for omissions of data and for known variations from Contract requirements.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation and reference standards.

C. Submit proposed Product Schedule in PDF electronic file format.

1.10 ELECTRONIC DOCUMENTS

A. The Architect will, at his sole discretion and without obligation, make graphic portions of the contract documents available for use by the Contractor in electronic format for Contractors' use in preparing submittals. These electronic documents are available in the .DXF or .DWG format for AutoCAD (current release), at no cost.

1. All dimensions, verbiage and statistical information will/may be removed.
2. Use of these electronic documents is solely at the Contractors' risk, and shall in no way alter the Contractor's responsibilities under the contract for construction.
3. The Architect will not be responsible or liable for errors, defects, inexactitudes, or anomalies in the data, information, or documents (including drawings and specifications) caused by the Architect's or his consultants' computer software or hardware defects or errors; the Architect's or his consultants' electronic or disk transmittal of data, information or documents; or the Architect's or his consultants' reformatting or automated conversion of date, information or documents electronically or disk transmitted from the Architect's consultants to the Architect.
4. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

1.11 ELECTRONIC RECORD DRAWINGS SUBMITTALS

A. The Architect will release the computer drawing files at no cost to the Contractor for the purpose of the Contractor(s) returning these as Record Documents. At completion of work, the Contractor shall submit As-Built / Record Drawings to the Architect in electronic AutoCAD .dwg format and one set of marked-up Record Prints. Electronic drawings shall be submitted in .dwg format. The following file formats are not acceptable formats (.tif, .jpg, .jpeg, .pdf).

B. Refer to the "Computer File Release Application & Electronic Record Drawings Agreement" contained in this Project Manual.

1.12 SHOP DRAWINGS

A. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. For drawings requiring large details, full-size hardcopy drawings, 24 inches by 36 inches or larger must be submitted in addition to a PDF electronic file.

B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Identification of products and materials included by sheet and detail number.
2. Dimensions.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Relationship and attachment to adjoining construction clearly indicated.
7. Seal and signature of professional engineer if specified.

C. Coordination drawings are a special type of shop drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination drawings is specified in Section 01 31 00 – Project Coordination, and may include components previously shown in detail on shop drawings or product data.

D. After review, reproduce and distribute in accordance with “Submittal Procedures” above, and for record documents described in Section 01 77 00 –Closeout Procedures.

E. Submit shop drawings in PDF electronic file format.

1.13 PRODUCT DATA

A. Collect product data into a single submittal for each element of construction or system. Product data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where product data must be specially prepared because standard printed data is not suitable for use, submit as "shop drawings". Do not submit product data until compliance with requirements of the Contract Documents has been confirmed.

B. Mark each copy to show which products and options are applicable. Where printed product data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information as applicable:

1. Manufacturer's catalog cuts
2. Manufacturer's product specifications
3. Standard color charts
4. Statement of compliance with specified referenced standards.
5. Testing by recognized testing agency.
6. Application of testing agency labels and seals.
7. Availability and delivery time information.
8. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the work.

1. The data shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as by evidence of compliance with performance standards, to demonstrate conformance to the Specification requirements.
2. Catalog numbers alone are not acceptable.
3. The data shall include, but shall not be limited to, the name and address of the nearest service and maintenance organization that regularly stocks repair parts. No consideration shall be given to partial lists submitted unless otherwise noted.
4. Review of materials and equipment is tentative, subject to submission of complete shop drawings indicating compliance with the Contract Documents.
5. Cross out information which is not applicable to the work.
6. Supplement standard information to provide additional information which is applicable to the work.

7. Show dimensions and clearances required.
8. Show performance characteristics and capacities.

D. Do not proceed with installation until a copy of product data is in the Installer's possession.

E. Submit Product Data before or concurrent with Samples.

F. Submit Product Data in PDF electronic file format.

1.14 SAMPLES

A. Submit the required number of physical samples required, the Architect will retain a minimum of two (2) physical Samples, remainder will be returned unless otherwise provided. Cure and finish samples as specified and physically identical with the material or product proposed.

B. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

C. Mount, display, or package samples in the manner to facilitate review of quantities indicated. Prepare samples to match the Architect's sample. Include the following information attached with label on unexposed side of Samples and include the following:

1. Generic description of the sample.
2. Specification section number and paragraph number reference.
3. Sample source.
4. Product name or name of manufacturer.
5. Compliance with recognized standards.
6. Availability and delivery time.

D. Submit the required number of physical samples required, the Architect will retain a minimum of two (2) physical Samples, remainder will be returned unless otherwise provided. Cure and finish samples as specified and physically identical with the material or product proposed.

E. Samples may include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing colors, texture and pattern. Illustrate functional and aesthetic characteristics of materials, equipment, or workmanship, with integral parts and attachment devices. Coordinate sample submittals for interfacing Work.

F. Where variation in color, pattern, texture or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.

G. Refer to other Specification sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.

H. Reviewed samples which may be used in the Work are indicated in individual specification sections.

I. Disposition: Maintain sets of approved Samples at Project site, available for quality- control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

J. Furnish additional certification of conformance to the specification requirements as may be requested by the Architect.

1.15 QUALITY ASSURANCE SUBMITTALS

A. Submit quality control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other sections of the specifications.

B. Where other sections of the Specifications require certification that a product, materials, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 –Project Coordination.

D. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 – Construction Progress Documentation.

E. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 45 00 – Quality Requirements.

F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 – Closeout Procedures.

G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

H. Certificates:

1. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
2. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
3. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Reports:

1. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
2. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
3. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
6. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
7. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

1.16 DELEGATED-DESIGN SERVICES

A. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and paper copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. Submittals of shop drawings, product literature or data, samples, etc., shall be made for complete assemblies or units of the Work. Submittals which represent only a portion of a part of a larger assembly or unit of work is not acceptable and will be rejected by the Architect.

B. Check shop drawings, project data and samples prior to submission. Shop drawings not indicating evidence of checking by Contractor will be returned without review by the Architect. No time extensions will be permitted for this type of resubmittal.

C. All submittals must bear a stamp indicating that the Contractor has reviewed the submittal prior to forwarding to the Architect, or they will be returned to the Contractor without action.

D. Coordinate each submittal with requirements of the Work and of Contract Documents.

E. Contractor is not relieved of responsibility for errors or omissions in shop drawings, product data, samples or similar submittals by Architect's approval thereof.

F. Contractor is not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation.

G. Notify Architect, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

H. Begin no work which requires submittals until return of submittals with Architect's stamp and initials or signature indicating review.

I. Materials or equipment installed prior to the required shop drawing, product data, or sample approval shall be subject to removal and replacement by the Contractor at no additional cost to the Owner, if in the opinion of the Architect, such materials or equipment do not meet the requirements of the Contract Documents.

J. No xerographic or altered xerographic reproductions of the Contract Documents are permitted as submittals. Facsimiles or copies of facsimiles are not acceptable as required submittals to be furnished under this section.

3.02 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

1. Approved
2. Approved as Noted
3. Revise and Resubmit.
4. Submit Additional Information
5. Rejected
6. Not Required for Review

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

D. Review of submittals is not for the purpose of determining the accuracy or completeness of details, dimensions, or quantities, or for substantiating instructions for installation or performance of equipment or systems.

E. Architect's review is not for approval of safety precautions or of construction means, methods, techniques, sequences, or procedures.

F. Approval of a specific item shall not indicate approval of an assembly of which the item is a component.

G. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

H. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

I. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

SCHOOLEY CALDWELL

ARCHITECTURE. INSPIRED.

COMPUTER FILE RELEASE APPLICATION & ELECTRONIC RECORD DRAWINGS AGREEMENT

COMPANY NAME & ADDRESS: **[COMPANY NAME]**
[Address]
[Phone]

[Date]

APPLICANT NAME / TITLE: [Name / Title]
[Email Address]

PROJECT: **BICENTENNIAL BARN – MCCAMMON CREEK PARK**

Schooley Caldwell will release the computer files to the Contractor. At completion of work, the Contractor agrees to submit As-Built / Record Drawings to Schooley Caldwell in AutoCAD/REVIT© electronic file formats and one set of marked-up Record Prints. The following file formats will not be accepted as AutoCAD .dwg files: .tif, .jpg, .jpeg, or .pdf.

[LIST FILES HERE]

Upon receipt by Schooley Caldwell of this approved application, Schooley Caldwell will produce electronic files containing the Architectural "Base" file including walls, doors, and windows, but excluding notes, dimensions, borders, and engineering content. These files are to provide a background for contractors and ***are not*** exact copies of the bid set or any other set.

Any use or reuse of the original or altered files by the Applicant or others will be at the Applicant's sole risk and full legal responsibility. Furthermore, the Applicant will, to the fullest extent permitted by law, indemnify and hold Schooley Caldwell harmless from any and all claims, suits, liability, demands or costs arising out of or resulting there from.

REQUESTED BY: _____ DATE: _____
Contractor Signature

Authorization for use of Schooley Caldwell computer files must be approved in writing by Schooley Caldwell. Unauthorized use or copying of Schooley Caldwell computer files is not permitted.

SCHOOLEY CALDWELL AUTHORIZATION:

APPROVED BY: _____ DATE: _____
Signature

c: [Names or delete this line if no one copied]

300 Marconi Boulevard
Columbus, Ohio 43215

T 614 628.0300
F 614 628.0311

schooleycaldwell.com

SECTION 01 35 91

SPECIAL PROCEDURES FOR HISTORIC TREATMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes special procedures for historic treatment on Project including, but not limited to, the following:

1. Historic removal and dismantling.
2. Storage and protection of existing historic materials.
3. Temporary protection of historic materials during construction.
4. Protection during application of chemicals.
5. Protection during use of heat-generating equipment.
6. Historic treatment procedures.

B. This specification applies to all tasks when they are used on Historic Buildings or Historic Sites.

C. Related Section:

1. Section 01 42 00 – Reference Standards and Definitions: General definitions

1.02 REFERENCES AND STANDARDS

A. Publications listed below shall be the most recent issue and will form a part of this Specification to extent referenced. Publications are referred to in text by designation only.

B. Protection of Site and Historic Properties

1. All work shall be performed in accordance with the “Secretary of the Interior’s Standards for Rehabilitation, “U.S. Department of the Interior, National Park Service, 1995.” They can be found at http://www.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm.

1.03 HISTORIC TREATMENT DEFINITIONS

A. Dismantle: To disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby historic surfaces; and legally dispose of dismantled items off-site, unless indicated to be salvaged or reinstalled.

B. "Existing to Remain" or "Retain": Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled.

C. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful restoration as determined by the Architect. All exterior and interior spaces areas rooms and surfaces of the building are included in this designation and considered significant.

D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

E. Material in Kind: Material that matches existing materials, as much as possible, in species, cut, color, grain, and finish.

F. Preservation: To apply measures necessary to sustain the existing form, integrity, and materials of a historic property. Work may include preliminary measures to protect and stabilize the property.

G. Protect: The term "protect" shall mean to cover, enclose, shield or take other designated measures to avoid damage or harm. Items protected will either remain in place, or will be salvaged for re-installation in the Work. The type of protection shall be as specified. Where the type of protection is not specified, items shall be protected from any and all damage, scratches, marking, overspray, dripping, deterioration, or movement from any and all activities scheduled to take place on this Project, and/or would be typical to a Project site such as this one.

H. Reconstruction: To reproduce in the exact form and detail a building, structure, or artifact as it appeared at a specific period in time.

I. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

J. Rehabilitation: To make possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.

K. Re-install: The term "re-install" or "re-installation" shall mean to install a removed, salvaged or stored item or material in the Work.

L. Repair: To stabilize, consolidate, or conserve; to retain existing materials and features while employing as little new material as possible to return an existing material as closely as possible to its original form, structural integrity and condition. Repair includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials. Within restoration, repair also includes limited replacement in kind, rehabilitation, and reconstruction, with compatible substitute materials for deteriorated or missing parts of features when there are surviving prototypes. Generally, the types of work required to achieve a “repaired” condition are the following:

1. Disassembly of existing components or construction for the purpose if installing new components.
2. Removal of the component or portion of an assembly designated for repair.
3. Preparation of the adjacent surfaces to receive the repair.
4. Installation and securing the repaired component in the assembly.
5. Preparation of the assembly to receive a finish as specified in the finishing or painting specification.

M. Replace: To duplicate and replace entire features with new material in kind. Replacement includes the following conditions:

1. The term "replace" shall be defined as providing in a former position or place.
2. The term may be combined with such terms as “with existing” or “with new” which define exactly what is to be replaced.
    a. Duplication: Includes replacing elements damaged beyond repair or missing. Original material is indicated as the pattern for creating new duplicated elements.
    b. Replacement with New Materials: Includes replacement with new material when original material is not available as patterns for creating new duplicated elements.
3. Refer to individual specification sections for further definition of “replace” as it relates to a specific application or condition.

N. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

O. Remove: The term "remove" shall mean to detach or separate an item, component or assembly from its installed location, and dispose of off-site, unless indicated to be removed and salvaged or removed and reinstalled. Removal shall be accomplished without damage to adjacent materials, components or systems that are to remain. Damage that must be incurred during removal shall be repaired as cutting and patching.

P. Restore (restoration):

1. The term "restore" shall be defined as a general term for the process of returning a material, component, system or portion of work as nearly as possible to its original form or condition when it was new.
2. The term "restore" when used in a general sense may include the process of ‘repair’ defined herein.
3. Refer to individual specification sections for further definition of “restore” as it relates to a specific application or condition.
4. Generally, the process involved with “restore” or “restoration” include the following:
    a. Removal of applied items or materials which are not to be part of the restored work.
    b. Stripping or other types of removal of surface applied coatings (i.e., paint).
    c. Modifying the material if it is required to accommodate new work.
    d. Replacement of portions of components or materials that cannot be restored because of condition, including those that are deteriorated or otherwise damaged. Replacement is typically done with ‘dutchmen’ in the case of stone repair.
    e. Reinforcing broken components when this procedure is acceptable in lieu of “repair.”
    f. Tightening and securing open or loose joints.
    g. Patching or plugging holes or other severe loss of the existing material.

h. Filling of minor holes, scratches, dents, or other deformation not associated with normal wear and tear.
i. Sanding of the repaired surfaces smooth as a result of the restore process, prior to final surface preparation for finishing.

5. Minor surface preparation of a reconditioned surface prior to other finishing or painting is not considered part of the “restore” process, and is specified as preparation in the finishing or painting specification.
6. It is not the intent of the “restore” process to return a material that shows normal wear to an original “like new” appearance or condition. Rather, such wear is considered a normal part of the use and life of the particular material, and as such does not require “restoring”

Q. Salvage: The term "salvage" shall mean the removal of items, components, equipment or materials from their installed location, and protection and storage of such items, components, equipment or materials. Salvaged items will be designated either to be re-installed in the Work, stored, or turned over to the Owner or other designated entity, plus such other Work as described.

R. Stabilize: To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

S. Strip: To remove existing finish down to base material in preparation for refinishing.

1.04 ACTION SUBMITTALS

A. Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's historic treatment operations.

1. Photographs of Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by historic treatment operations. Submit before work begins.

C. Alternative Methods and Materials: If alternative methods and materials to those indicated are proposed for any phase of work, provide a written description including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this Project.

1.05 INFORMATIONAL SUBMITTALS

A. Construction Schedule for Historic Treatments: Indicate for entire Project the following for each activity to be performed on historic surfaces:

1. Detailed sequence of historic treatment work, with starting and ending dates, coordinated with other known work in progress.
2. Utility Services: Indicate how long utility services will be interrupted.
3. Use of elevator and stairs.

B. Qualification Data: Division 00 – Bidders Qualifications: Competency of Specialists.

1.06 QUALITY ASSURANCE

A. The Newark arcade is a historically significant structure. In addition to all other requirements all Work of this Section shall be performed under the guidelines of the Secretary of the Interior’s *Standards for the Treatment of Historic Properties*. While Work under this Contract is in progress, protect existing building,

grounds, contents, and occupants, including those on adjacent property, whether private or public, from damage or harm.

1. It is the intent of this Section that:

    a. All work will be done using the gentlest methods available.
    b. Sound historical materials will not be put at risk due to the work of this section.

B. Historic Treatment Specialist Qualifications: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to this work as specified in each section, and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrate the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site during times that historic treatment work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
2. Worker Qualification: Persons who are experienced in historic treatment work of types they will be performing.

C. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on Project site during times that historic treatment work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

1. Worker Qualification: Persons who are experienced in historic treatment work of types they will be performing.

D. Historic Treatment Preconstruction Conference: Conduct conference at Project site.

1. General: Review methods and procedures related to historic treatment including, but not limited to, the following:

    a. Review manufacturer's written instructions for precautions and effects of historic treatment procedures on materials, components, and vegetation.
    b. Review and finalize historic treatment construction schedule; verify availability of materials, equipment, and facilities needed to make progress and avoid delays.
    c. Review qualifications of personnel assigned to the work and assign duties.
    d. Review material application, work sequencing, tolerances, and required clearances.
    e. Review areas where existing construction is to remain and requires protection.

2. Removal and Dismantling:

    a. Inspect and discuss condition of construction to be removed or dismantled.
    b. Review requirements of other work that relies on substrates exposed by removal and dismantling work.

E. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-prevention devices during each phase or process. Coordinate plan for fire-protection equipment and requirements. Include each fire watch's training, duties, and authority to enforce fire safety.

F. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Prepare mockups of specific historic treatment procedures specified in other Sections.

1.07 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling during historic treatment. When permitted, items may be removed to a suitable, protected storage location during historic treatment and cleaned and reinstalled in their original locations after historic treatment operations are complete.

B. Storage and Protection: When removed from their existing location, store historic materials within a weathertight enclosure where they are protected from wetting by rain, snow, or ground water, and temperature variations. Secure stored materials to protect from theft.

1. Identify removed items with an inconspicuous mark indicating their original location.
2. Secure stored materials to protect from theft.

C. Removed and Salvaged Historic Materials:

1. Clean salvaged historic items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to the Project.
4. Transport items as directed. Protect items from damage during transport and storage.

D. Removed and Reinstalled Historic Materials:

1. Identify, catalog, label, and record removed location of items for reinstallation so they are reinstalled in the same location as they were removed.
2. Repair and clean historic items as indicated and to functional condition for reuse.
3. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
4. Protect items from damage during transport and storage.
5. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

1.08 PROJECT CONDITIONS

A. Exterior Cleaning and Repairing:

1. Proceed with the work only when forecasted weather conditions are favorable.

a. Wet Weather: Do not attempt repairs during rainy or foggy weather. Do not apply primer, paint, putty, or epoxy when the relative humidity is above 80 percent. Do not remove exterior elements of structures when rain is forecast or in progress.
b. Do not perform exterior wet work when the air temperature is below 40 deg F (5 deg C).
c. Do not begin cleaning, patching, or repairing when there is any likelihood of frost or freezing.
d. Do not begin cleaning when either the air or the surface temperature is below 45 deg F (7 deg C) unless approved means are provided for maintaining a 45 deg F (7 deg C) temperature of the air and materials during, and for 48 hours subsequent to, cleaning.

2. Perform cleaning and rinsing of the exterior only during daylight hours.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 EXAMINATION

A. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

1. Comply with requirements specified in Section 01 32 33 – Photographic Documentation.

B. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities have been disconnected and capped.

2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
4. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.

C. Anchorages:

1. Remove anchorages associated with removed items.
2. Dismantle anchorages associated with dismantled items.
3. In non-historic surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section specific to the historic surface being patched.

3.02 PROTECTION, GENERAL

A. Ensure that supervisory personnel are present when work begins and during its progress.

B. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

C. Temporary Protection of Historic Materials during Construction:

1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials.
2. Attachments of temporary protection to existing construction shall be approved prior to installation.

D. Protect landscape work adjacent to or within work areas as follows:

1. Provide barriers to protect tree trunks.
2. Bind spreading shrubs.
3. Use coverings that allow plants to breathe and remove coverings at the end of each day.
4. Do not cover plant material with a waterproof membrane for more than 8 hours at a time.
5. Set scaffolding and ladder legs away from plants.

E. Existing Roofing: Prior to the start of work in an area, install roofing protection as indicated.

F. Existing Drains: Prior to the start of work or any cleaning operations, test drains and other water removal systems to ensure that drains and systems are functioning properly. Do not begin Work of this Section until the drains are in working order.

1. Provide a method to prevent solids including stone or mortar residue from entering the drains or drain lines. Clean out drains and drain lines that become blocked or filled by sand or any other solids because of work performed under this Contract.
2. Protect storm drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.03 PROTECTION DURING APPLICATION OF CHEMICALS

A. Comply with requirements in Section 01 50 00 – Temporary Facilities and Controls.

B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.

C. Cover adjacent surfaces with materials that are proven to resist chemical cleaners selected for Project unless chemicals being used will not damage adjacent surfaces. Use covering materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

D. Do not clean surfaces during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

E. Neutralize and collect alkaline and acid wastes and dispose of off the Owner's property.

F. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.04 PROTECTION DURING USE OF HEAT-GENERATING EQUIPMENT

A. Comply with the following procedures while performing work with heat-generating equipment, including welding, cutting, soldering, brazing, paint removal with heat, and other operations where open flames or implements utilizing heat are used:

1. Obtain the Architect's approval for operations involving use of open-flame or welding equipment.
    a. Notification shall be given for each occurrence and location of work with heat- generating equipment.
2. As far as practical, use heat-generating equipment in shop areas or outside the building.
3. Before work with heat-generating equipment commences, furnish personnel to serve as a fire watch (or watches) for location(s) where work is to be performed.
4. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
5. Remove and keep the area free of combustibles, including, rubbish, paper, waste, etc., within area of operations.
    a. If combustible material cannot be removed, provide fireproof blankets to cover such materials.
6. Where possible, furnish and use baffles of metal or gypsum board to prevent the spraying of sparks or hot slag into surrounding combustible material.
7. Prevent the extension of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
8. Inspect each location of the day's work not sooner than 30 minutes after completion of operations to detect hidden or smoldering fires and to ensure that proper housekeeping is maintained.

B. Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, shield the individual heads temporarily with guards.

3.05 HISTORIC TREATMENT PROCEDURES

A. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.

B. The principal aim of preservation work is to halt the process of deterioration and stabilize the item's condition, unless otherwise indicated. Follow the procedures in subparagraphs below and procedures approved in historic treatment program:

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
3. Use reversible processes wherever possible.
4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
5. Use traditional replacement materials and techniques. New work shall be distinguishable to the trained eye, on close inspection, from old work.
6. Record the work before the procedure with preconstruction photos and during the work with periodic digital photographic documentation.

C. Obtain review and written approval in the form of a Constructive Change Directive or Supplemental Instruction before making changes or additions to construction or removing historic materials.

D. Notify Architect of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

E. Prohibit smoking by personnel performing work on or near historic structures.

F. Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to the approval of the Architect.

G. Where work requires existing features to be removed, cleaned, and reused, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

H. Identify new or replacement materials and features with inconspicuous, permanent marks to distinguish them from original materials. Record the legend of identification marks and the locations of these marks on Record Drawings.

I. When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid overcleaning to prevent damage to existing materials during cleaning.

END OF SECTION

SECTION 01 42 00

REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes general definitions for Specifications and other Contract Documents. Basic contract definitions are included in the Conditions of the Contract.

B. Comply with standards in effect as of date of the Contract Documents except comply with standards having different revision dates as referenced in the codes as indicated on Drawings.

C. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.
2. Section 01 35 91 – Special Procedures for Historic Treatment.

1.02 REFERENCE STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standard have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents except for those having different revision dates as referenced in the codes indicated on Drawings.

C. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

1.03 GENERAL DEFINITIONS

A. Note: Definitions related to historic treatment procedures are found in Section 01 35 91 – Special Procedures for Historic Treatment.

B. General Explanation: Basic Contract definitions are included in the Contract. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations that follow are not necessarily either complete or exclusive, but are general for the Work to the extent they are not stated more explicitly in other provisions of the Contract Documents.

C. Approved: The term "approved" where used in conjunction with Architect's action on the Contractor's submittals, requests, and applications, is limited to the Architect's duties and responsibilities as specified in the Conditions of the Contract. In no case will "approval" by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of Contract Documents.

D. Bulletin: A document issued by the Architect, after execution of the Contract requesting a proposal from the Contractor which, if approved as provided in the Contract Documents, will cause the execution of a Change Order to modify, amend or alter the Contract Documents.

E. Contract Completion: The date upon which all deficiencies noted in the “punch list” have been corrected, the Contractor’s work is 100 percent complete, and the Contractor has complied with all conditions precedent to final payment and release of retainage.

F. Cutting and Patching: The term "cutting and patching" means cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

1. Cutting and patching is performed for coordination of the Work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

2. Cutting and patching performed during the manufacturer of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching."

G. Demolish: The term "demolish" shall mean to wreck or destroy a structure or building system assembly (such as floor or ceiling system, walls or partitions, etc.) and the removal of wrecked materials from the job site. Where new work is not specified for the adjoining surface, selective demolition shall require "cutting and patching" wherever demolished portions of a structure adjoin portions to remain.

H. Directed, Requested, etc.: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect" "requested by Architect" and similar phrases. However, no such implied meaning shall be interpreted to extend Architect's responsibility to Contractor's area of construction supervision.

I. Experienced: When used with an entity or individual, 'experienced' means having successfully completed a minimum number of projects similar in nature, size, and extent to this Project; and having a number of years of experience (as defined in the specification section) being familiar with special requirements indicated; and having complied with requirements of building code officials and industry standards.

J. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

K. General Contractor and Contractor: These terms are used interchangeable throughout Division 01 and Divisions 02 through 49, referring to the procedural requirements affecting both the administration of the work and the work of individual trade contractors.

L. Indicated: The term "Indicated" is a cross-reference to graphic representations, notes, or schedules on the Drawings or other paragraphs or Schedules in the Specifications, and to similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

M. Install: Except as otherwise defined in greater detail, the term "install" describes operations at Project Site including the actual unloading, temporary storage, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.

N. Installer: An Installer is the Contractor or an entity (person or firm) engaged by the Contractor, either as an employee, subcontractor or contractor of lower tier, to perform a particular construction activity, including installation, erection, application and similar required operations. Installers are required to be experienced in the operations they are engaged to perform.

1. Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

O. ORC: The Ohio Revised Code.

P. Product: Includes natural and manufactured materials, components, machinery, fixtures, equipment, devices, furnishings, systems, and their associated accessories to be incorporated into the Work.

Q. Project Manual: The volume(s) assembled for the Work which may include Introductory Information, Bidding Requirements, Contract Forms, Conditions of the Contract, the Specifications, and Reference Materials.

R. Project Site: The project site Is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing either work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.

S. Provide: Except as otherwise defined in greater detail, the term "provide" means to furnish and install, complete and ready for the intended use.

T. Regulation: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

U. Request for Information (RFI): A request for information by the Contractor to the Architect of Record for clarification of intent of any portion of the Contract Documents after the Award of Contract and during the construction of the Project.

V. Review: Where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in the General Conditions and Supplementary Conditions. Such review shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.

W. Store: The term "store" shall mean to protect and place in a designated area. Where an area is not designated, the Contractor responsible for the item shall provide adequate and reasonable facilities acceptable to the Architect.

X. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1. Refer instances of uncertainty to Architect for decision before proceeding.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

1. Referenced standards (referenced directly in Contract Documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to Work.
2. Publication Dates: Comply with standard in effect as of the date of the Contract Documents, unless otherwise indicated.
3. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source.
4. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the content of the text provision.

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1.05 GOVERNING REGULATIONS AND AUTHORITIES

A. The Architect has contacted authorities having jurisdiction where necessary to obtain information to prepare Contract Documents. Contact authorities having jurisdiction directly for information and decisions regarding the Work.

B. For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts of fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 43 30

MOCKUPS

PART 1 – GENERAL

1.01 SUMMARY

A. General: Provide and coordinate mock-up assemblies at Project site for Architect's review and acceptance, in accordance with requirements of the Contract Documents. Refer to individual Specification Sections for mock-up requirements. Generally, without limitation, mock-ups on site include the following:

1. Mockup are full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.

B. Providing mock ups prior to starting final work is an important part of the submittal and approval process. Special attention and advanced scheduling are required for the required mock ups. Furnish and install full size mock ups at the project site for review by the Architect. Furnish and install full size mock ups off site as is necessary for testing purposes.

C. It shall be the responsibility of the Contractor to coordinate the work of the related Specification Sections so that each mock-up meets the specified requirements.

D. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.
2. Refer to other Division 01 sections and other Contract Documents for specifications on administrative, non-work-related submittals.

1.02 DEFINITIONS

A. Mock-up Definition: Full size physical assemblies, construction on site, that incorporate several materials or elements of construction. Mock-ups are erected for Architect’s review and approval of exterior and interior visual features and workmanship. Mock-ups represent quality of materials, interface between dissimilar materials and workmanship; approved mockups establish the standard by which the Work will be judged.

B. Freestanding Mock-Ups: Full-size, physical assemblies that are constructed on-site in a protected location.

1. Freestanding mock-ups are not part of the final construction. Freestanding mock-ups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects, qualities of materials and execution, and to review construction, coordination, testing, and operation.
2. Approved freestanding mock-ups establish the standard by which the Work will be judged.
3. Approved freestanding mock-ups remain on site during the balance of construction and are demolished and removed from site at completion of the Work they represent.

C. In-Place Mock-Ups: Full-size, physical assemblies that are constructed in-place and remain part of final construction.

1. In-place mock-ups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects, qualities of materials and execution, and to review construction, coordination, testing, or operation.
2. Approved in-place mock-ups establish the standard by which the Work will be judged.
3. Approved mock-ups remain part of the completed Work.

1.03 ACTION SUBMITTALS

A. Schedule of Mock-Ups: Within fourteen (14) days after receipt of Notice of Award and prior to purchasing of materials, the Contractor shall develop and submit a complete schedule of required mock-ups to the Architect and Owner for review and comment.

1. Mock-up schedule shall be reviewed at each progress meeting, revised and resubmitted as required.
2. Schedule shall allow sufficient time for mock-ups which are not accepted to be reconstructed and reviewed until accepted by the Architect.

B. Notification: Notify Architect seven days in advance of dates and times when mockups will be constructed.

C. Shop Drawings of Mock-Ups: Provide large scale shop drawings for fabrication, installation and erection of all parts of each mock-up. Provide plans, elevations, and details of anchorage, connections and accessory items.

D. Photographs of Mock-Ups: Submit photographs of mock-ups after completion of installation and acceptance of each mock-up.

E. Submittal Samples: Refer to individual Specification Sections for submittal requirements of mock-up components and coordinate accordingly.

1.04 QUALITY ASSURANCE

A. General: Provide In-Place or Stand-Alone mock ups as indicated in and meeting following:

1. Use materials, fabrication and installation methods identical with those indicated for Work. Simulate actual construction conditions as accurately as possible.
2. Provide mock-ups for start of each assembly required by individual Specification sections at location acceptable to the Architect.
3. Mock-up coordination drawings and requirements for pre-installation conference: Refer to Section 01 31 00 –- Project Coordination for requirements.
4. Construct mock-ups in accordance with approved mock-up coordination drawings.
5. Deviations from or additions to details shown are subject to Architect's approval.
6. Approval:
    a. Obtain Architect's written approval for each mock-up.
    b. Do not complete production of materials for final Project site erection until Architect's approval of mock-up has been obtained.
    c. Approved In-Place mock-ups will become part of finish Work when approved by the Architect and will serve as standard of quality and workmanship of Work.
    d. Where mock-up is rejected, or testing of mock-up fails to meet performance criteria included under Related Sections, replace, rebuild and or modify mock-up as directed by Architect.
7. Removal of Mock-Ups: Upon completion of relevant Work, or when directed by the Architect, Contractor shall demolish and remove mock-ups, both stand-a-lone and rejected in place mock-ups, at no additional cost to the Work.

B. In-Place Mock Up: Provide In-Place mock-up of components identified in the individual technical sections of specifications and as required to fulfill and implement specified requirements for each building component. Mock up shall be used to evaluate the various components, including but not limited to workmanship, weatherability and aesthetic of finishes. Exterior components will include structural and non-structural support framing, cladding, fenestration and flashing assemblies to extent indicated on the drawings. Interior components will include supporting assemblies and trim for finishes as indicated in individual sections.

1. Allow preconstruction conference to take place with all affected installation contractors and materials suppliers.
2. Review integration of work between the specific specification sections and coordinate details shown on approved fabrication drawings.
3. Review critical aspects of sequencing and installation of materials required to maintain water-resistant barrier, air-barrier and integrity of exposed and concealed flashings for diverting water to exterior face of envelope.
4. Determining optimum times for material representative's field services, reports, developing quality control procedures specific to project, and as required to validate respective manufacturer's warranty.
5. Review procedures for in-situ special inspection testing by installation contractor and third party testing agency in accordance with Section 01 45 00 – Quality Requirements, as applicable.

C. Stand-Alone Mock-Ups: Provide mock-ups in locations on site approved by Architect and Owner and comply with requirements indicated above for in-place mock-ups.

1. Mock-ups shall remain on site, as the standard for completing the Work, until approved otherwise by the Architect.
2. Remove as indicated above.

PART 2 – PRODUCTS

2.01 MATERIALS AND PRODUCTS

A. Provide materials, components, and products for mock-ups as specified in individual Specification Sections.

PART 3 – EXECUTION

3.01 GENERAL

A. Refer to PART 3, EXECUTION portions of the various Specification Sections for specific requirements regarding condition of surfaces, erection, and erection tolerances.

3.02 MOCK-UPS

A. Provide mock-ups of types and sizes required by individual Specification Sections to evaluate and set the standard of quality for that work. Obtain Architect's acceptance of visual qualities prior to commencing work that individual mock-up is intended to represent. Protect and maintain approved mock-ups throughout the work of the Contract. Locate mock-ups at the Project site as directed by the Architect.

1. Provide as many mock-ups as required until Architect's approval has been received.
2. When indicated in individual Specification Sections, approved mock-ups may be incorporated into the finish work.

3.03 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as non-visible as possible.

B. Protect construction exposed by or for quality-control service activities.

3.04 REMOVAL AND DISPOSAL

A. Demolish and remove free-standing mock-ups (if any) from site at the completion of the Project. Legally dispose of demolished mock-up materials. Legally dispose of demolished mock-up materials.

END OF SECTION

SECTION 01 45 00

QUALITY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for Contractor's quality control and testing and inspection services and administrative and procedural requirements for Special Inspection and testing by third party testing agency.

B. Quality control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Architect.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

D. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.
2. Refer to other Division 01 sections and other Contract Documents for specifications on administrative, non-work related submittals. Such submittals include, but are not limited to the following items:

a. General Conditions: (Tests), inspections, testing, and approvals.
b. Section 01 33 00 – Submittal Procedures: Submission of manufacturers' instructions and certificates.
c. Section 01 43 30 – Mockups
d. Section 01 45 33 – Special Inspections and Procedures
e. Section 01 73 29 – Cutting and Patching: Requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.02 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

F. Special Inspection: Inspection by a testing agency, as required by the International Building Code Chapter 1704, of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.03 ACTION SUBMITTALS

A. Schedule of Tests and Inspections: Prepare and submit a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Include Contractor performed tests and those of sub-contractors. Include testing by third party engaged by the Architect. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.
14. Highlight non-conforming test results.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.04 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Factory-Authorized Service Representative Qualifications: An Owner of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.

I. Comply fully with manufacturer’s instructions, including each step in sequence. Installation shall be carried out in a manner to reduce damage to or waste of materials by needed replacement. Should manufacturer’s instructions conflict with Contract Documents, request clarification from Architect before proceeding.

J. Comply with specified standards as a minimum quality for Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

K. Perform work by persons qualified to produce workmanship of specified quality.

L. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

M. Verify that field measurements are as indicated on construction and/or shop drawings before confirming product orders or proceeding with work, in order to minimize waste due to excessive materials.

1.05 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Contractor shall provide quality-control services specified and required by authorities having jurisdiction for their work.

1. Where services are indicated as Contractor’s responsibility, engage a qualified testing agency to perform these quality-control services.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in triplicate, of each quality-control service to the Architect, and Owner.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor’s responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Price will be adjusted by Change Order.

D. Special Tests and Inspections: Contractor shall engage a testing agency selected by the Architect/Owner to conduct special tests and inspections. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

1. Testing agency will notify Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Project Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

G. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in triplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

H. Architects Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor, materials, and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.06 REFERENCES

A. Conform to reference standard by date specified in product sections, or if not indicated, the date of issue current on date of Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

C. For products or workmanship specified by reference to association, trade, or industry standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

D. Should specified reference standards conflict with Contract Documents, request clarification for Architect before proceeding.

E. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

1.08 SPECIAL INSPECTIONS BY THIRD PARTY

A. Refer to Section 01 45 33 – Special Inspections and Procedures for requirements.

1.09 CONTRACTORS OTHER TESTING AND INSPECTION SERVICES

A. The Owner shall employ and pay for services of an independent commercial testing and inspection agency to perform professional consultation, inspections, tests, and other services indicated in individual specification sections.

B. Testing and Inspection Agency Responsibilities:

1. Provide competent technicians experienced in review and inspection of portion of work under review.
2. Perform specified inspections, samplings, and testing of materials and methods of construction in compliance with requirements of governing authorities and with specified standards.
    a. Comply with standards other recognized authorities, and as specified in individual Specification Sections of this Project Manual.
    b. Ascertain compliance of materials with requirements of Contract Documents.
3. Testing agency shall:
    a. Receive material samples, mix designs, etc. delivered to laboratory and perform testing.
    b. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
    c. Provide field testing equipment and items needed to measure and test.
    d. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
    e. Should certain testing or space criteria be needed provide timely notification to Contractor prior to start of the test activity.
    f. Perform additional tests and/or inspections as needed.
4. Testing agency personnel are not authorized to:
    a. Revoke, alter, enlarge on, or release requirements of Contract Documents
    b. Approve or accept any portion of Work
    c. Perform duties of Contractor
    d. Direct or stop work
5. Submit one copy each of report to Owner, contractors, Architect, and consultants as applicable within 3 days following tests. Distribution shall be as follows:
    a. Owner: 1 copy
    b. Contractor: 1 copy
    c. Architect: 1 copy

6. Notify Architect, and Contractor of observed irregularities or non-conforming work or products not later than 2 hours following observation.
7. Testing agency personnel shall attend progress meetings and coordination meetings when their presence in needed.

C. Contractor Responsibilities:

1. Cooperate fully with testing agency personnel; furnish samples of materials, design mix, equipment, storage and assistance as requested.
2. Notify testing agency sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests, but in no case shall notification be less than one-week.
3. Secure and deliver to testing agency adequate quantities of representative samples of materials proposed to be used that require testing.
4. Provide to testing agency preliminary design mix proposed to be used for concrete, and other materials mixes that require control.
5. Furnish copies of product tests or mill test reports as required.
6. Furnish incidental labor and facilities:

   a. To provide access to work to be tested
   b. To obtain and handle samples on-site or at source of product to be tested
   c. To facilitate inspections and tests
   d. For storage and curing of test samples

7. Make arrangements with testing agency and pay for additional samples and tests for Contractor's convenience.

1.10 PROJECT LAYOUT AND CONTROL

A. Layout of all work shall be the responsibility of the Contractor.

B. Maintain control points accessible to all contractors and personnel, set permanent monuments.

1.11 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, testing, and adjustment as applicable, and to initiate instructions when necessary.

B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Architect for review.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Section 01 73 29 – Cutting and Patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including temporary utilities, temporary construction and support facilities, temporary security and protection and measures to conserve energy.

1. Contractors requiring temporary service facilities before it can be provided as specified, or whose requirements with respect to a particular service differ from the service specified, shall provide service as required to meet their needs, and at their own expense.
2. Provide “lock out” tags for equipment or services temporarily taken out of service.
3. Provide temporary drainage for the work and use trenches, drains, sumps, or other necessary elements as required to afford satisfactory working conditions for execution and completion of the work of all Contractors and to protect all work.

    a. Pumping of water from excavations (including site utilities) as required for the work.
    b. No damming or ponding of water in gutters or other waterways will be permitted.

4. Maintain temporary facilities and keep in good operating condition for the entire construction period. Provide maintenance personnel necessary to perform this work. Maintenance time will include normal working hours for all trades and start up and shut down overtime as required.

B. Temporary construction and support facilities required include but are not limited to:

1. Field offices and storage sheds.
2. Temporary sanitary facilities, including drinking water.
3. Temporary construction barriers.
4. Shoring and bracing.
5. Hoists.
6. Weather protection.
7. Project identification signs.
8. Waste disposal services.

C. Temporary utilities required include but are not limited to:

1. Temporary electric service for power and light.
2. Temporary lighting.
3. Temporary water.
4. Storm and sanitary services.

D. Security and protection facilities required include but are not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Watchman services.

E. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section.

F. General: Installation and removal of temporary facilities shall be included in the Contract Sum unless otherwise agreed. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

G. Coordinate plumbing with local utility and connect to main at street. Provide temporary meters and extend service to central location on site.

H. Provide labor and material for installation and maintenance of temporary light and power for construction purposes for all trades including cost of running or extending temporary service from the utility supply.

1. Arrange and pay for temporary pole line construction, if required, from the public utility.

1.02 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction.

1. Indicate Contractor personnel responsible for management of fire-prevention program.

1.03 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

A. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

B. Install temporary work in a manner to not interfere with permanent construction. If interferences do occur, it is the Contractor's responsibility to make required changes to overcome the interference.

C. Restore all damaged off-site and on-site paved areas used for storage and by construction vehicles to conditions equal to or better than original.

D. Coordinate and cooperate with Owner in scheduling work and using spaces, including parking spaces and driveways.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide new materials; if acceptable to Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Section 06 10 00 – Rough Carpentry.

1. For signs, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sizes and thickness indicated.
2. Temporary enclosures for window openings during restoration of windows.
3. For enclosures, safety barriers, and similar uses, provide minimum 5/8 inch thick exterior plywood.

C. Paint: Comply with requirements of Section 09 91 00 – Painting.

1. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
2. For temporary enclosures, safety barriers and similar uses of exposure to weather, provide exterior-grade plywood painted with acrylic-latex emulsion over exterior primer. Color to be provided by Architect.

D. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary weather protection and other uses, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

E. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

2.02 EQUIPMENT

A. Provide new equipment; if acceptable to Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. First Aid Supplies: Comply with governing regulations.

C. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Remove each temporary facility when the need has ended, when replaced by authorized use of permanent facility, or no later than Substantial Completion. Complete, or if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

3.02 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall protect his own work and existing or adjacent property against weather, to maintain their work, materials, apparatus and fixtures free from injury or damage in accordance with the General Conditions during the entire construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Work damaged by failure to provide protection required, shall be removed and replace with new work at the Contractor's expense.

B. Protect the work in progress in accordance with the provisions of this article and the provisions of individual specification sections.

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.
6. Keep interior spaces reasonably clean and protected from water damage.
7. Periodically collect and remove waste containing cellulose or other organic matter.
8. Do not install material that is wet.
9. Discard or replace water-damaged material.
10. Discard, replace, or clean stored or installed material that begins to grow mold.

C. Protect the project and existing or adjacent property from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take precautions to prevent injury or damage to individuals or property.

3.03 TEMPORARY FIELD OFFICE AND STORAGE SHEDS

A. Field Offices: Use space in building designated by Owner. Space will accommodate needs of Owner, Architect, and construction personnel office activities and accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials safely apart from buildings.

3.04 TEMPORARY SANITARY FACILITIES

A. Sanitary facilities include temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best service project needs.

B. Provide temporary portable self-contained chemical type toilets, acceptable to public health authorities, quantity equal to one toilet for each 25 men/women on project. Computation of men/women present includes men/women of each Contractor, and Architect's and Owner's personnel. Shield toilets to ensure privacy. Locate temporary toilets where directed.

1. Provide toilet tissue, paper towels, and similar disposal materials for each facility. Provide covered waste containers for used materials.
2. Maintain temporary toilets in an antiseptic condition until completion of Work. Clean toilets a minimum of once a week or more often if required. Installation shall be provided in a manner acceptable to Owner, Architect, and governing Board of Health.

3.05 TEMPORARY WATER FOR CONSTRUCTION USE

A. Water is available at the existing building. Connect to Owner's existing water service facilities. Consumption charges are to be paid by the Owner.

B. Furnish the necessary hoses, nozzles, connectors, accessories and temporary extensions to properly service his own requirement, and Contractors shall be held responsible for damage resulting from his careless use of water.

C. Provide potable drinking water facilities as required for the workers. The temporary water service is a potable water service. Contractor may use this as a source or provide his own water. Ice shall be provided by the Contractor, as required.

3.06 TEMPORARY CONSTRUCTION BARRIERS, FENCES, AND STAIRS

A. Provide temporary construction barriers for protection of construction in progress and when completed, from exposure, foul weather, other construction operations, and similar activities. Construction barriers shall be constructed of sound materials, properly braced, and maintained in a safe condition, meeting applicable local, state, and federal requirements, labor laws, regulations and requirements as follows.

1. Install tarpaulins securely, with incombustible wood framing and other materials.
2. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood framed construction.

B. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

C. Protection-Area Fencing: Install protection-area fencing along edges of protection areas before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings.
2. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect. Space posts a maximum of 8 feet on-center and at corners of fence line.
3. Install fencing so that, at a minimum, it is at the drip-line of the tree or shrubs being protected. Fencing may be installed outside of the drip-line but not within the drip-line.

D. Maintain protection-area fencing in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-area fencing, even temporarily, to allow deliveries or equipment access through the protection area.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

E. Provide and maintain temporary stairs, ladders, ramps, railings, guards, runways, and similar constructions required for proper execution of the work of all trades to protect and secure the site from the public, and to allow the public safe access around the site.

1. Provide exterior staging and scaffolding required for the work.

3.07 SHORING AND BRACING

A. Provide temporary shoring and bracing required for safety and execution of the work. Remove temporary shoring and bracing when work is completed and support materials are no longer needed.

3.08 WEATHER PROTECTION

A. Protect the work and existing or adjacent property against weather and maintain work, materials, apparatus, and fixtures free from injury or damage during the construction period. Cover or protect work at the end of each day's work. Remove work damaged by failure to provide protection and provide new work meeting project requirements at Contractor's expense.

1. Remove snow and ice as required for proper protection and execution of the work and protection and safety of the public.
2. Provide weather closures at roof openings, window openings, and temporary doors at enclosed openings.
3. Maintain temporary water pumps to keep building basement areas and pits clear of water accumulations at all times.

B. Refer to “Temporary Construction Barriers” for requirements of tarpaulins.

3.09 TEMPORARY ENCLOSURES

A. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior openings.

1. Provide necessary measures to protect temporary and final work, existing building, material and equipment from weather damage. This includes ground water, rainwater, wind, ice, snow and the backing up of sewers and drains.
2. Provide temporary insulated weather tight closures of all openings in exterior walls and roofs.
    a. Provide this protection. Where existing building is conditioned with heating or cooling, provide insulated temporary enclosures in openings.
    b. In existing construction, provide temporary enclosures for exterior windows that are to be restored or replaced.
3. Maintain existing roof drains and protect areas of partial demolition until area is enclosed and weather tight.
4. Maintain existing site drainage, exterior catch basins and areaway drains within construction site so water does not pond.
5. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
6. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

3.10 WASTE DISPOSAL SERVICES

A. Keep the entire project site in a clean and sanitary condition during the entire progress of the Work and shall post and take precautions to keep the site clean.

1. Provide a dumpster or other trash container of adequate size for use by all Contractors. Rental and dump fees shall be paid by the Contractor.
2. If materials to be recycled or reused on the project must be stored on-site, provide suitable non-combustible containers.

B. Maintain project site in a neat and orderly manner. Remove daily packaging material and other debris from the work and deposit in trash container or other location provided by the Contractor. Areas shall be left broom clean at the end of each construction activity.

1. Comply with NFPA 241 requirements for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly.

C. Contractors shall remove debris as it accumulates. If waste materials are not cleaned up in a reasonable length of time, General Contractor will do the required work when directed in writing by Architect or Owner.

D. After removal of debris during construction as specified, perform remaining site and building clean-up. Final cleaning is specified in Section 01 77 00.

3.11 TEMPORARY UTILITY INSTALLATION, GENERAL

A. Install temporary service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.12 TEMPORARY ELECTRICAL SERVICE FOR POWER AND LIGHTING

A. Provide labor and material for installation and maintenance of temporary light and power for construction purposes for all trades including cost of running or extending temporary service from the utility supply.

1. Arrange and pay for temporary pole line construction, if required, from the public utility.

B. Provide a weatherproof, grounded electric service and distribution systems of sufficient size, capacity, and power characteristics during construction period. Include panelboards, grounding, branch circuits, switches, transformers, overload protected disconnects, automatic ground-fault interrupters, and main distribution switchgear, receptacle outlets, and all other labor and materials necessary to provide a complete operating system including any special power company fees.

1. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground- fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
2. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
3. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

C. Lay out, balance, and size temporary wiring to produce a voltage drop of no more than 5 percent at the extreme end of the line when operating at full load.

D. General all-purpose power shall be 120/208 volt, 1 phase, 3 wire, 200 amp. Power receptacles to be provided in sizes and quantities as follows:

1. Branch circuits feeding receptacles shall be rated for 20 amps. Space receptacles so they can be reached with a 50 foot extension cord for 120 volt appliances and a 100 foot extension cord for 208 volt appliances from any part of the building.
2. All plug-in receptacles shall be 20 amp duplex, NEMA ground type.

E. Securely and neatly install panels on substantial framework, mounted on floor. Any panel installation which does not meet the approval of Owner or Architect shall be remounted in an acceptable manner.

F. Provide for a safe and satisfactory temporary wiring installation, shall maintain entire system at all times and remove temporary wiring when permanent wiring is installed.

G. Contractor using temporary electrical service shall furnish their own extension cords, receptacle plugs, and adaptors. (See also "Field Offices and Storage Sheds" in this Section for additional requirements.)

H. Temporary services to heavy equipment, such as hoists and lifts, will be the responsibility of Contractors requiring the temporary service.

I. No temporary wiring, fittings, receptacles, or other parts of the temporary system shall be used in the permanent electrical installation.

J. Contractor shall pay for the cost of electrical power consumed during construction period.

3.13 TEMPORARY LIGHTING

A. Temporary lighting distribution will be made from specified temporary panels. Provide a minimum of one lamp for every 500 square feet of floor area, and every space over 80 square feet in area. Provide a portable light for any space under 80 square feet which requires lighting to complete work.

1. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures for exposure to moisture.
2. Provide temporary lighting by stringing No. 10 conductors and "pigtail" sockets throughout the building. Temporary lighting circuits shall originate with 30 amp disconnect switches fused at 20 amps and connected to the line side of the 60 amp disconnect switches. Do not place more than 20 lamp sockets per circuit.

B. Install and operate temporary lighting to fulfill safety, security, and protection requirements, without operating entire system, and to provide adequate illumination for construction operations and traffic conditions. Include lighting required in stairways, at barricades, and similar locations.

1. Provide security lighting throughout construction area (interior and exterior). Security lighting shall be automatically controlled through a photo-cell or time switch to provide adequate illumination during night hours. Provide site lighting, including walkways, as required for safe access around the site. Illumination of these areas shall equal that currently exist at the site.

3.14 TEMPORARY WATER

A. Coordinate with local utility and connect to main at street. Provide temporary meters and extend service to central location on site.

B. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. Furnish and install temporary risers, hose bibbs, and other items required for temporary service. Protect temporary water service from damage and freezing.

1. Sterilization: Sterilize temporary water piping before use.
2. Locate outlets so any part of building construction can be reached with 100 foot hose extension.
3. Transport water from water service location to point of use and coordinating use with other trades.
4. Provide permanent main water service throughout new facility as soon as practical to distribute water for sanitary and construction purposes.

C. Contractor shall pay the cost of water used during construction period.

3.15 TEMPORARY FIRE PROTECTION

A. Take all necessary precautions to guard against and eliminate all possible fire hazards and to prevent damage to any construction work, building materials, equipment, storage sheds, and all other property, both public and private. The emergency number of the local fire department shall be conspicuously posted in field offices. Take precaution to prevent fire hazards in accordance with all fire protection regulations and codes, including the following:

1. Prohibit smoking on construction site.
2. FIRE EXTINGUISHERS: Provide and maintain in working order, at all times during construction, fire extinguishers conveniently located for proper protection. Personnel working on the Project shall be familiarized with the locations and operation of fire extinguishers.
3. Store combustible materials in containers in fire safe locations.
4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
5. In case of fire, notify the fire department immediately. Contractor's workmen shall assist in extinguishing the fire until firefighting personnel arrives.
6. Perform no welding, flame cutting or other operations involving the use of flame, arcs or sparking devices without adequate protection and shielding. Remove all combustible and flammable materials from the immediate working area. If removal is impossible, protect all flammable or combustible materials. Provide the necessary personnel and firefighting equipment to effectively control any fire resulting from welding, flame cutting or other operations involving the use of flame, arcs or sparking devices.
7. For all flammable liquids having a flash point of 110 degrees F. or below, use Underwriter's Laboratories' labeled safety cans. Store the bulk supply of all flammable liquid at least 75 feet from the building and yard storage of building materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums shall be equipped with approved vent pumps.
8. Use only fire resistant tarpaulins.
9. Develop and supervise an overall fire-prevention and first aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
10. Provide fire watch for all open flame activities.

3.16 BARRICADES, WARNING SIGNS, AND LIGHTS

A. Provide and maintain all barricades, warning lights, and other safety devices required for the security, protection, and safety of the work and employees as well as the public.

B. Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform Contractor's and Owner's personnel and the general public of hazards being protected against.

1. Provide lighting, including flashing red or amber lights, when required at barricades, railings, obstructions in streets, drives, or sidewalks and at all trenches or pits adjacent to public walks or roadways.

C. Maintain safety barricades through construction process and remove when directed.

1. Provide safety cables around building perimeter and interior openings on each floor. Provide temporary handrails at open sides of stairs and stair platforms.
2. Provide other safety barricades, including temporary safety rails, as required to accommodate project conditions.

D. Plan and conduct work operations so two-way traffic is maintained at all times on adjacent and on-site streets and drives. Furnish lights, signs, barricades, and watchmen necessary for safe flow of traffic, 24 hours daily.

3.17 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Paved Areas: Maintain paved areas adequate for construction operations.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

3.18 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.19 PROTECTION OF THE PUBLIC

A. Precautions to prevent injury to the public or damage to property of others shall be taken. Maintain protection of the Work from damage and protect the Owner’s property for injury or loss arising from the Work. Provide and maintain at all times OSHA-approved danger signage, guards, and obstructions necessary to protect the public and construction personnel from dangers inherent with or created by the construction of the Work.

B. Twenty-four Hour Call: Contractor shall have personnel on call 24 hours per day for emergencies during the course of the Project. Furnish Owner with a 24-hour emergency contact number of Contractor and Contractor’s personnel. Contact information made available to the Owner shall include office , home and mobile numbers for the following:

1. Contractor's project manager
2. Contractor's field superintendent
3. Owner or company officer of the Contractor.

C. When necessary to maintain public use of work areas involving sidewalks, entrances to buildings, lobbies, corridors, aisles, stairways, vehicular roadways, etc., the Contractor shall protect the public in accordance with all applicable laws and regulations.

D. Covered sidewalks shall be equipped with permanent lights to provide sufficient illumination for safe use by the public day or night. All bulbs will be cage-protected and kept operational; public walkways and roadways shall be kept clean and free of all recognized hazards and maintained for the safe and unobstructed movement of pedestrian and vehicular traffic.

E. Sidewalks, sheds, canopies, catch platforms and appropriate fences shall be provided, when necessary, to maintain Public pedestrian traffic adjacent to the erection, demolition or structural alteration of outside walls on any structure is underway;

F. Temporary fencing shall be properly secured and anchored and provided around the perimeter of aboveground operations adjacent to Public areas;

G. Signs, signals or other control devices used to regulate vehicular traffic shall meet the requirements of the local authority having jurisdiction for work on or near Project Site.

H. All warning signs and lights shall be maintained along guardrails, barricades, temporary sidewalks and at every obstruction to the Public. Lights shall be placed at both ends of such protection or obstructions and not over 20 feet apart alongside of such protection or obstruction;

I. Required signs and symbols shall be visible at all times when work is being performed and shall be removed or covered promptly when the hazards no longer exist;

J. Barricades, cones, and/or similar channeling devices shall be used whenever employees or the Public are exposed to traffic or similar hazards;

K. When traffic patterns are closed or altered due to work activity, instructional or warning signs shall be posted.

3.20 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall protect his own work and existing or adjacent property against weather, to maintain their work, materials, apparatus and fixtures free from injury or damage in accordance with the General Conditions during the entire construction period. Work likely to be damaged shall be covered or protected at the end of each day's work. Work damaged by failure to provide protection required, shall be removed and replace with new work at the Contractor's expense.

B. Protect the work in progress in accordance with the provisions of this article and the provisions of individual specification sections.

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.
6. Do not load or install gypsum board or other porous materials or components, or items with high organic content, into partially enclosed building.
7. Keep interior spaces reasonably clean and protected from water damage.
8. Periodically collect and remove waste containing cellulose or other organic matter.
9. Do not install material that is wet.
10. Discard or replace water-damaged material.
11. Discard, replace, or clean stored or installed material that begins to grow mold.
12. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

C. Protect the project and existing or adjacent property from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take precautions to prevent injury or damage to individuals or property.

D. Security Enclosure and Lockup: Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Provide for the security of the building during periods when work is not being performed. Coordinate access barrier locations which can be secured with a lock to prohibit access during periods when work is not being performed. If these locations are not available in existing construction, provide suitable secure temporary partitions with lockable access doors.
2. The General Contractor is responsible for locking and unlocking the temporary entrances to the building at the start and end of each day. Any Contractor requiring access outside of the project working hours must coordinate with this Contractor.

E. Utility Protection:

1. Existing utility lines and structures indicated or known, and utility lines constructed for this Project shall be protected from damage during construction operations by the Contractor.
2. Locate and flag lines and structures before beginning excavation and other construction operations.
3. When utility lines and structures that are to be removed or relocated are encountered within the area of operations, notify the Contractor and affected utility in ample time for the necessary measures to be taken to prevent interruption of the services.
4. Damage to existing utility lines or structures not indicated or known shall be reported immediately to the General Contractor and the affected utility.

3.21 DUMPSTERS

A. Provide dumpsters as required to service the project. Contractors failing to load dumpsters properly and/or failing to break down cartons, ductwork, etc. will be charged for removal of partially filled dumpsters. Schedule all dumpster deliveries and pickups. The site will allow a construction trailer and dumpster located as directed by the Owner.

B. Daily cleanup of the Contractor's debris is mandatory for this project and is to be included in the Contract. Contractor is responsible to properly transport general debris to the dumpster or trash container locations and compaction of debris into said containers in a manner that allows containers to be fully utilized. Materials not removed by the Contractor or improperly stored, will be discarded, as directed by the Architect, at the delinquent Contractor's expense, including replacement of material, if required.

C. Only normal construction debris may be discarded in the dumpsters. Any hazardous materials shall be removed from the project by the Contractor creating or responsible for the debris.

D. No burning of trash or debris is allowed.

3.22 TEMPORARY ACCESS AND PARKING

A. Refer to notes on drawing for description of contractors use of parking spaces and Section 01 11 00 – Summary of Work, Article "Contractors' Use of Premises."

B. Traffic Controls: The Contractor to comply with requirements of authorities having jurisdiction.

1. Contractor shall assign a workman to assist construction vehicles arriving and departing the construction site and to monitor and protect vehicular and pedestrian traffic.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

3.23 CONSTRUCTION AIDS

A. Architect’s Access to the Work: Facilitate access to the worksites for the Architect and Owner’s representative examination of all portions of the Work while in progress, and during closeout phase of the work. The Architect will communicate the dates of site visits near the completion of the work. The Contractor shall either maintain such cranes, hoists, ladders, scaffold towers, swing stages, and planking for areas of the work requiring inspection, or shall provide and operate such equipment at the time of notice of such an inspection. Such equipment shall remain available until notified by the Architect.

B. Provide temporary cranes, hoists, chutes, scaffold and scaffold towers, swing stages, planking, ladders, and similar items necessary for proper and efficient movement of materials, and operating personnel as required for the performance of the Work by all trades. Such apparatus and equipment shall meet requirements of labor laws, federal safety regulations, and other applicable codes, laws, and regulations of authorities having jurisdiction.

C. Protect permanent construction from damage, staining, or marring due to use of chutes, hoists, scaffolds, staging, etc.

D. Hoists: Provide, erect, and maintain adequate temporary construction hoists required for the prosecution of the work.

E. Provide scaffolds, ladders and vertical transportation as required for the Work. Use of existing stairs will be permitted.

F. Do not free-drop materials, rubbish or debris.

3.24 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 – Closeout Procedures.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections/Documents:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section. Such sections include, but are not limited to the following items

   a. Section 01 25 00 – Substitution Procedures
   b. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
   c. Section 01 42 00 – Reference Standards and Definitions for applicable industry standards for products specified.
   d. Section 01 77 00 – Closeout Procedures for submitting warranties for contract closeout.

1.02 DEFINITIONS

A. Definitions in this paragraph are not intended to change the meaning of other terms used in Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," "furnishings," "special construction," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

B. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. "Named Products" are items identified by manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, which is current as of date of the Contract Documents.
2. "New Products" Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products.
3. "Comparable Product" is a product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

C. "Basis-of-Design" Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

D. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or

product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

E. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Burden of Proof: The burden of proof as to the applicability of the proposed comparable product as well as documentation sufficient for the Architect's review is the responsibility of the Contractor.
3. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

1.03 ACTION SUBMITTALS

A. Prepare a Schedule of Materials and Equipment showing products specified in tabular form acceptable to the Architect. Include the manufacturer's name and proprietary product names for each item listed. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.

1. Prepare product list with information on each item tabulated under the following column headings:

a. Related Specification Section number.
b. Generic name used in Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's named and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.

2. Within 15 days after execution of Owner/Contractor Agreement, submit 3 copies of the Proposed Product List. Provide a written explanation for omissions of data and for known variations from Contract requirements.

B. Comparable Product Requests: Submit one copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If comparable product request is approved, Architect will identify comparable product in an addendum.

a. Form of Approval: As specified in Section 01 33 00 – Submittal Procedures.
b. If sufficient time is not allowed for Architect's review and subsequent approval of a comparable product prior to issuing the final addendum, the "Basis of Design" product shall be used.

2. Documentation: Show compliance with requirements for comparable product and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed comparable product complies with requirements in the Contract Documents and is appropriate for applications indicated.

3. Burden of Proof: The burden of proof as to the applicability of the proposed comparable product as well as documentation sufficient for the Architect's review is the responsibility of the Contractor.

1.04 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

C. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store products according to the manufacturer's recommendations using methods and means that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinated delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

C. Packaging:

1. Deliver products to the Project site in their manufacturer's original container, with labels intact and legible.
    a. Maintain package materials with seals unbroken and labels intact until time of use.
    b. Promptly remove damaged material and unsuitable items from the project site, and promptly replace with material meeting the specified requirements at no additional cost to the Owner.
2. The Architect may reject as non-complying such materials, equipment, and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, or other pertinent information.

D. Protection:

1. Protect finished surfaces, including but not limited to jambs, soffits or openings used as passageways, through which material and material are transported.
2. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
3. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

E. Repairs and Replacements:

1. In the event of damage, promptly make replacements and repairs to the satisfaction of the Owner and at no additional cost to the Owner.
2. Additional time required to secure replacements and to make repairs will not be considered justification for an extension in the Contract Time of Completion.

F. Storage:

1. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Protect stored products from damage and liquids from freezing.
7. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

1.06 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 50. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 – Closeout Procedures.

PART 2 – PRODUCTS

2.01 GENERAL PRODUCT COMPLIANCE

A. General: The compliance requirements, for individual products as indicated in Contract Documents, are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.

1. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
2. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
3. Provide products which are free of asbestos and lead.
4. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

2.02 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Basis-of-Design Product: Where Specifications name a product or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
2. Named Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor’s convenience will not be considered.
    b. Nonrestricted List: Where Specifications include a list of names of available products followed by "but are not limited to", provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
b. Nonrestricted List: Where Specifications include a list of available manufacturers followed by "but are not limited to", provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
6. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
c. Custom Color or Range: Where Specifications include the phrase "custom color, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from a palate separate from manufacturer's standard and premium items.

2.03 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, which is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Evidence that the proposed product has the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified Product “Standard”:
3. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate the proposed unnamed product.
4. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
5. Evidence that proposed product provides specified warranty.
6. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
7. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 33 00 – Submittal Procedures.

1. Form of Approval of Submittal: As specified in Section 01 33 00 – Submittal Procedures.

2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install, erect, connect, condition, use, adjust, and clean products in accordance with manufacturer's instructions and in conformity with specified requirements.

1. Verify and coordinate clearances, dimensions and installation of adjoining construction, equipment, piping, ducts, conduits, or other mechanical or electrical items or apparatus.
2. Prior to fabrication, field measure actual existing conditions to ensure proper fit.
3. Inspect each item of material or equipment immediately prior to installation. Reject damaged and defective items.
4. Recheck measurements and dimensions of Work, as an integral step of starting each installation. Whenever stock manufactured products are specified, verify actual space requirements for setting or placing into allotted space. No extra cost will be allowed for adjustment of Work to accommodate particular product.

B. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

D. Install products at the time and under conditions that will ensure the best possible results in coordination with entire project. Maintain conditions required for product performance until Substantial Completion.

1. Isolate each unit of work from incompatible work as necessary to prevent deterioration.
2. Coordinate enclosure of work with required inspections and tests to minimize necessity of uncovering work for those purposes.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels during building occupied hours.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide attachment and connection devices and methods for securing work to withstand stresses, vibration, physical distortion, disfigurement, or racking.

1. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work
2. Mounting Heights: Where not indicated, mount individual units of work at industry recognized standard mounting heights for particular application indicated.

    a. Refer questionable mounting heights choices to Architect for final decision.
    b. Elements Identified as Accessible: Comply with applicable codes and regulations.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral

anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

4. Secure work true to line and level, and within specified tolerances, or if not specified, industry recognized tolerances. Allow for building movement, including thermal expansion and contraction.
5. Physically separate, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints. Refer questionable visual-effect choices to Architect for final decision.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

K. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components to ensure operability without damaging effects.

L. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section. Such sections include, but are not limited to the following items:

   a. Section 01 31 00 – Project Coordination for procedures for coordinating field engineering with other construction activities.
   b. Section 01 33 00 – Submittal Procedures for submitting surveys.
   c. Section 01 73 29 – Cutting and Patching for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
   d. Section 01 77 00 – Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.02 ACTION SUBMITTALS

A. Provide the following in conformance with Section 01 30 00 – Submittal Procedures.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and or professional engineer registered in the state where the Project is located.

B. Certificates: Submit certificate signed by land surveyor and or professional engineer registered in Ohio certifying that location and elevation of improvements comply with requirements. If required by the Owner, the Owner will pay for the cost of surveying unless the building is not in compliance with the Contract Documents, then the Contractor will pay the cost.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two (2) copies signed by land surveyor or professional engineer licensed in the state where the Project is located.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Coordination."

3.03 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Allow for building movement, including thermal expansion and contraction.
2. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.04 LIMIT EXPOSURE

A. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.05 CUTTING AND PATCHING

A. Refer to Section 01 73 29 – Cutting and Patching.

3.06 PROGRESS CLEANING

A. Clean and protect construction in progress and adjoining materials in place during handling and installation. Apply protective covering where required to assure protection from damage or deterioration until Individual Substantial Completion dates.

B. During the progress of the work, remove all waste materials and rubbish and deposit such waste in the project dumpster. Perform daily broom cleaning in the area of the Contractor’s work. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period.

1. Keep the premises free at all times from all waste materials, packaging materials and other rubbish accumulated in connection with the execution of work by collecting and depositing said materials and rubbish in locations or containers as designated by the Contractor.
2. Clean and remove from own work soiling, staining, mortar, concrete or dirt caused by the execution of work and make good additional defects resulting therefrom.
3. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

a. Remove liquid spills promptly.
b. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

4. Absolutely no burning of debris or trash will be allowed.
5. At the completion of portions of the Work and the entire completion of work, remove all tools, equipment, scaffolds, shanties, and surplus materials. Execute all required final cleaning.

C. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.07 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.08 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 – Cutting and Patching.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes requirements and limitations for cutting, demolition, removal work, patching and restoration of work as necessary to accomplish and complete all work under the Contract, including relocation or reuse of existing materials, equipment, systems, or other work, as well as the disposition of salvaged materials or debris.

1. This Section applies to all work under the Contract, including general construction, mechanical and electrical work.

B. Related Sections:

1. Drawings and general provisions of Contract, including General Conditions and Division 01 Specification sections, apply to Work of this section. Such sections include, but are not limited to the following items:

a. Section 01 33 00 – Submittal Procedures: Requirements for submittals.
b. Section 01 73 00 – Execution
c. Section 02 41 19 – Selective Demolition for demolition of selected portions of the building for alterations.

2. Divisions 03 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

a. Requirements in this Section apply to mechanical and electrical installations. Refer to Division 20 and 30 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.02 DEFINITIONS

A. "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

1. "Cutting and patching" is performed for coordination of the Work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

a. Cutting and patching performed during the manufacturer of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching."

2. "Toothing in" – is the process of removing masonry at a specific location in the existing wall for the purpose of creating an opening in the existing wall, or to fill an existing opening by removing half-blocks such other full stretcher units can be installed to fill the opening in a toothed pattern. Follow procedures described herein.
3. “Channeling” is a cutting and patching process to remove the minimum amount of finish and substrate materials necessary to “Channel” a path on the face of a surface to permit the installation of new electrical service in the work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

C. "Selective Demolition" is a related but separate category of work which may or may not require cutting and patching required in this section.

1.03 INFORMATIONAL SUBMITTALS

A. Procedural Proposal for Cutting and Patching: Prior approval of cutting and patching is required for work which is not identified or inferred from the Contract Documents; therefore, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal.

1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
2. List products, equipment, and techniques to be used and firms that will perform work.
3. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
    b. Include contingency plan addressing additional resources, alternative means of communicating, unexpected defective valves and/or breakers, security arrangements and change in schedule due to resident activities.
    c. Identify who are the authorized decision makers for the Owner and Contractor. .
4. Give a schedule of dates when work is expected to be performed.
5. List products, equipment, and techniques to be used and firms that will perform work.
6. Where cutting and patching of structural work involves the addition of reinforcement it shall be integrated with original structure to satisfy requirements.
7. Approval by the Architect to proceed with cutting and patching work does not waive the Architect's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.
8. Furnish adequate collection and removal of water for concrete cutting and coring.

1.04 QUALITY ASSURANCE

A. Before cutting and patching decorative finish material to remain in the work, obtain the Architect's approval to proceed. Review cut and patch procedures involved in the work with the Architect prior to start of such work.

B. Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, included energy performance, or that would result in increased maintenance, or decreased operational life or decreased safety.

C. Cut and patch in a manner that is compatible with the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Review cut and patch procedures involved in the work with the Architect prior to start of such work. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Review cutting of structural elements (concrete slab, beams etc) with Architect prior to starting work. Refer to structural drawing for recommendation for cutting and patching of floor slabs. Refer to structural drawing for required lintels for new openings.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
    a. Foundation construction
    b. Bearing and retaining walls
    c. Structural concrete
    d. Structural steel
    e. Lintels
    f. Timber and primary wood framing
    g. Structural decking
    h. Stair systems
    i. Miscellaneous structural metals
    j. Exterior curtain wall construction

k. Equipment supports
l. Piping, ductwork, vessels, and equipment

2. Cutting and Patching Concrete: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical, electrical trades and Owner. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

E. Operational Elements and Safety Limitations: Do not cut and patch operating elements and safety related components in a manner that results in reducing their capacity to perform as intended or which results in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Shoring, bracing, and sheeting
b. Primary operational systems and equipment
c. Fire separation assemblies
d. Air or smoke barriers
e. Fire suppression assemblies
f. Mechanical systems piping, ducts and vessels
g. Water, moisture, or vapor barriers
h. Membranes and flashings
i. Equipment supports
j. Fire protection systems
k. Fire detection and alarm systems
l. Sprayed fire-resistive material/fire-rated structural components
m. Noise and vibration control elements and systems
n. Stairs
o. Control systems
p. Communication systems
q. Conveying systems
r. Electrical wiring systems
s. Operating systems of special construction
t. Elevators

F. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity which results in reducing their capacity to perform as intended, or which results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

1.05 COORDINATION

A. Provide cutting of construction for the installation of work, to uncover work for access or inspection, for coordination with other work, or for similar purposes, and provide for patching required to restore surfaces to original or modified condition.

B. Determine the location and size of opening required for the installation of the work. Cost of cutting and patching shall be borne by the Contractor requiring the opening or access.

C. Coordinate the locations and installation of sleeves and supporting devices to be installed in the construction for the installation of their work in the new construction.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide same products or types of construction as that in existing structure, as needed to patch, extend, or match existing work. Generally, Contract Documents do not define product or standards of installation

present in existing construction; Contractor shall determine products by inspection and necessary testing and installation by use of the existing as a sample for comparison.

B. Materials for patching shall match existing adjacent surfaces to the fullest extent possible with regard to visual effect and installed performance characteristics.

C. Presence of a product, finish, or type of construction, required that patching extending, or matching shall be performed as necessary to make work complete and result in equal or better standards of quality.

PART 3 – EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

B. Before the start of cutting work, coordinate layout of the work and resolve potential conflicts before proceeding.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Temporary Support: Provide temporary support to ensure structural integrity of affected portions of Work.

1. Provide devices and methods to protect other portions of Project from damage.
2. Provide materials and control operations to prevent spread of dust in surrounding area. Provide drop cloths or other suitable barriers.

B. Protect in place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

C. Take precautions not to cut existing pipe scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. Perform cutting and removal of existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Employ skilled workmen capable of matching existing quality of existing construction to perform cutting and patching work. Proceed with cutting and patching at the earliest feasible time and complete work without delay.

C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or preferably to prevent interruption to occupied areas.

D. Cut, fit and patch, including excavation and backfill, to complete Work and to:

1. Fit several parts together, to integrate with other work.
2. Uncover portions of work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of Contract Documents.
5. Remove samples of installed work as necessary for testing.
6. Provide openings in elements of work for penetrations of plumbing, mechanical, and electrical work.
7. Uncover work to allow for Architect’s observation of covered work which has been covered up prior to required observation by Architect.

3.04 CUTTING AND REMOVAL REQUIREMENTS

A. Cut and remove existing construction as required, to accomplish the Work. Where new Work is to be installed in or adjacent to existing construction or existing work is to be replaced, remove or cut the existing construction as necessary to complete the Work of the Project.

B. Execute work with care. Existing construction that is to remain which is loosened, cracked, or otherwise damaged or defaced as a result of the cutting and is unsuitable for use intended shall be removed and replaced at no additional cost to the Owner.

C. Perform cutting and removal work to remove minimum materials and surfaces necessary using methods that are least likely to damage elements to be retained. Protect adjoining finishes to remain from damage.

1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through masonry using a cutting machine such as a carborundum saw or diamond core drill to ensure a neat hole. Cut finish surfaces such as masonry, clay tiles or metals using methods to terminate surfaces in a straight line at a natural point of division. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
2. By-pass utility services such as pipe, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut off pipe in walls or partitions to be removed. After by-pass and cutting; cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
4. Remove existing construction as noted or required to be removed in order to accommodate new work.

3.05 PATCHING REQUIREMENTS

A. Patch or otherwise restore disturbed existing construction as indicated on the drawings and schedules, or as otherwise required to restore the work and surfaces. Patching or restoration shall be carried to natural breaks (i.e., corners) wherever possible. Where existing construction is removed, cut or otherwise disturbed by Work of the Project, patch defective and incomplete surfaces. Repair any damage to existing construction which is to remain.

B. Patching work shall be done by skilled mechanics experienced in the particular type of work involved and shall conform to the standards of the Specifications.

C. Patch existing construction to match existing work (unless otherwise called for) except provide new materials and accomplish as for new work. Examine existing surfaces to be patched before proceeding with the work. Report all conditions where existing materials, colors and finishes cannot be matched to the Architect, and do not proceed until instructions have been given.

D. Construction that has been damaged as a result of the Work shall be repaired to an extent and as required to match adjacent existing undamaged construction.

E. Patch with durable seams that are as invisible as possible. Comply with specified tolerances for the work.

1. Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work.
2. Fit work tight to new sleeves, pipes, ducts, conduits and other penetrations through the wall surface.
3. At penetrations of fire rated wall and ceiling or floor construction, completely seal voids with fire-resistive sealant materials in accordance with Section 07 84 00 – Firestopping, to full thickness of the penetrated element.
4. Inspect and test patched areas to verify integrity of the installation.
5. Restore surfaces and conditions exposed by removal of existing equipment, features and items, i.e., holes, recesses, interruption of continuity of finishes, etc.
6. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

7. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
8. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Restoration: Except where indicated otherwise, restore exposed finishes of patched areas to match adjacent surfaces and where necessary extend finish restoration into retained adjoining surfaces in manner which will eliminate evidence of patching and refinishing. Thoroughly clean surfaces prior to application of paint and other finishes.

1. Where patching occurs in previously painted surface, provide appropriate prime coat followed by first finish coat of paint. Provide final finish coat over entire area containing patch; for continuous surface extend to nearest vertical break or intersection, for an assembly refinish entire unit. Except where indicated otherwise, finish in sheen and color to match adjacent surfaces.

3.06 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching work is performed or used as access to work.

B. Perform progress cleaning as specified in Section 01 73 00 – Execution.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Instruction of Owner's personnel.
4. Startup and Commissioning
5. Final cleaning.

B. Related Sections/Documents:

1. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification sections, apply to Work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

A. Definitions: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the Work.

1. Specified requirements for individual units of Work are specified in sections of Divisions 01 through 50.
2. Time of closeout is directly related to "Substantial Completion," and therefore may be either a single time period for entire Work or a series of time periods for individual parts of the Work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.
3. All items listed on the Certificate of Substantial Completion must be completed and all closeout requirements submitted to the Architect within sixty (60) days of the date of the Certificate of Substantial Completion. Failure to do so will result in issuance of a 72-hour notice to surety of record.

1.03 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.05 PRE-REQUISITES TO INDIVIDUAL SUBSTANTIAL COMPLETION DATES

A. General: Prior to requesting inspection for certification of substantial completion (for either entire Work or portions thereof), complete the following and list known exceptions in request:

1. In progress payment request, coincident with or first following date claimed, show either 100 percent completion for portion of Work claimed as "substantially complete," or list incomplete items, value of incompleteness, and reasons for being incomplete.
2. Submit statement showing accounting of changes to the Contract Price.

B. Inspection Procedures: Upon receipt of Contractor's request, Architect will either proceed with inspection or advise Contractor of pre-requisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise Contractor of Work which must be performed prior to

issuance of certificate; and repeat inspection when requested and assured that Work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.06 PRE-REQUISITES TO FINAL ACCEPTANCE

A. General: Prior to requesting Architect's final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit updated final statement, accounting for additional (final) changes to Contract Sum.
3. Submit certified prevailing wage reports for entire project.
4. Submit copy of final punch-list of itemized Work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by the Architect.
5. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.
6. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
7. Obtain and submit releases enabling Owner's full and unrestricted use of Work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
8. Make final change-over of locks and transmit keys to Owner, and advise Owner's personnel of change-over in security provisions.
9. Submit record drawings, maintenance manuals, and similar final record information.
10. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools, facilities and similar items.
11. Complete final cleaning up requirements.

B. Re-inspection procedure: Upon receipt of Contractor's notice that the Work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Architect will re-inspect the Work. Upon completion of re-inspection, Architect will either prepare certificate of final acceptance or advise Contractor of Work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list for each phase. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

B. Re-inspection procedure: Upon receipt of Contractor's notice that the Work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Architect will re-inspect the Work. Upon completion of re-inspection, Architect will either prepare certificate of final acceptance or advise Contractor of Work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.08 WARRANTIES REQUIREMENTS

A. Refer to individual sections of Divisions 01 through 50 for the determination of units of Work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

B. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

D. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

E. Replacement Cost: Upon determination that Work covered by the warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirement of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

F. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations. rights, or remedies.

1. The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

G. When the Contract documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

H. Submit written warranties to the Architect prior to the date for Final Completion. If the Architect's certificate of Final completion designates a commencement date for warranties other than the date of Final completion for the Work, or a designated portion of the work, submit written warranties upon request of the Architect.

I. When the Contract documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution. Refer to Divisions 02 through 50 sections for specific content requirements and particular requirements for submitting special warranties.

J. At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into and orderly sequence based on the table of contents of the Project Manual. When warranted construction requires operation and maintenance manuals provide additional copies of each required warranty, as necessary, for inclusion in each manual.

1. Bind warranties in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and assemble complete warranty submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
5. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01 FINAL CLEANING

A. General: Special cleaning for specific units of Work is specified in sections of Divisions 01 through 50.

B. Provide final cleaning of the Work. Comply with manufacturer's specific instructions for cleaning operations for materials installed and specified herein. The following are examples, but not by way of limitation, of cleaning levels required:

1. At the completion of phase portions of the Work and the entire completion of work, remove all tools, equipment, scaffolds, shanties, and surplus materials. Execute all required final cleaning.
2. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
3. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
4. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
5. Remove labels on installed materials and equipment which are not required as permanent labels.
6. Clean exposed hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Remove plaster and paint droppings, and other foreign substances.
7. Clean transparent materials, including glass in doors and windows to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.
8. Clean light fixtures, lamps, globes, and reflectors so as to function with full efficiency. Replace burned out bulbs and defective and noisy starters in fixtures equipped with same.
9. Vacuum clean and mop flooring surfaces.
10. Leave each phased area of the Project clean and ready for occupancy by the Owner. Maintain cleaning until acceptance by the Owner.

C. Removal of Protection: Remove temporary protection devices and facilities which were installed during course of the Work to protect previously completed Work during remainder of construction period.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINATENANCE DATA

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals
2. Operation manuals for systems, subsystems, and equipment.
3. Product maintenance manuals.
4. Systems and equipment maintenance manuals.

B. Related Sections/Documents:

1. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
2. Section 01 33 00 – Submittal Procedures: For submitting copies of submittals for operation and maintenance manuals.
3. Section 01 77 00 – Closeout Procedures
4. Divisions 02 through 50 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.02 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.03 ACTION SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner.
    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Owner, will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Agent will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Agent will return copy with comments.

1. Correct or modify each manual to comply with Architect's and Commissioning Agent's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Agent's comments and prior to commencing demonstration and training.

PART 2 – PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each operation and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Construction Manager.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable sizes. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Organization: Enable organization of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite files.

a. Create composite manual with bookmarks, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.
b. Name, configure, and organize files and in accordance with COBIE procedures.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold (8-1/2-by-11-inch) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. Avoid placing loose, oversize drawings in binder pockets. Use reduced drawings or place folded drawings in labeled envelopes bound in manual.
c. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.

9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Demonstration and Training: Provide labor for miscellaneous demonstration and training support during the warranty term.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.04 PRODUCT MAINTENANCE MANUALS

A. General: Information for care and maintenance shall be furnished for any item requiring more than ordinary custodial care. For mechanized equipment and electrical equipment, provide operation manuals. For special equipment, in addition to operation manuals, provide the original equipment manufacturers' demonstrations and operating instructions by factory trained employees to designated Owner personnel who will be operating the equipment.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and

service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 – EXECUTION

3.01 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 –Record Documents.

G. Comply with Section 01 77 00 – Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39

RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for project record documents including the following:

1. Record Drawings.
2. Record Specifications.
3. Miscellaneous record submittals

B. Related Sections:

1. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
2. Section 01 33 00 – Submittal Procedures: Electronic document submittal requirements.
3. Section 01 78 00 – Project Closeout for general closeout procedures.
4. Section 01 78 23 – Operation and Maintenance Data for operation and maintenance manual requirements.
5. Divisions 02 through 50 Sections for specific requirements for project record documents of the Work in those Sections.

1.02 DEFINITIONS

A. Project Record Documents: Contract drawings, specifications, and shop drawings, indicating "As-Built" conditions and actual products selected for use.

1.03 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes, protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark set to show the actual installation where installation varies substantially from Work originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of Work.
2. Mark new information important to Owner, but not shown on Contract Drawings or Shop Drawings, including the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order and other contract modifications.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Note related Change Order numbers, Field Order numbers, and other contract modifications, where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Electronic Submittals: Record Drawings:

1. Initial Submittal: Submit one set(s) of corrected Record CAD Drawings in electronic AutoCAD .dwg format and one set(s) of marked up Record prints. The following file formats will not be accepted: (.tif, .jpg, .jpeg, .pdf). Architect will initial and date each Record CAD drawing and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return Record Drawings and prints for organizing into sets, printing, binding, and final submittal.
2. Final Submittal: Submit one set(s) of Record CAD Drawings, one set of marked-up Record prints, and three copies printed form Record CAD drawings. Print each drawing, whether or not changes and additional information were recorded.

D. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.

1. Legibly mark and record at each “Product” section of each Specification Section, the description of the actual products installed, including the following:

    a. Manufacturer’s name and product model and number.
    b. Product substitutions or alternates utilized.
    c. Changes made by Addenda or Bulletin.

2. Upon completion of the Work, submit record Specifications to Architect for Owner's records.

E. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from manufacturer's installation instructions and recommendations.

1. Legibly mark each Product Data submittal indicating actual product number and model installed in the Work.
2. Note related Change Orders.
3. Markup applicable record drawings and Specifications.
4. Upon completion of markup, submit complete set of record Product Data to Architect for Owner's records.

F. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size.

1. At a minimum, Operation and Maintenance Manuals shall contain:

    a. Manual index cross referencing specification numbers for each item.
    b. Operating instructions.
    c. Emergency instructions.
    d. Spare parts list.
    e. Copies of warranties.
    f. Wiring diagrams.
    g. Recommended maintenance procedures and “turn around” cycles.
    h. Inspection and system-test procedures.
    i. Copies of applicable Shop Drawings.
    j. Copies of applicable Product data.
    k. Fixture lamping schedule.
    l. Maintenance drawings and diagrams.
    m. Listing of required maintenance materials.
    n. Precautions against improper maintenance.
    o. All organized by Specification Section.
    p. Names and addresses of nearest service outlets, distributors, or factory outlets for each piece of equipment.

2. Commence preparation of manuals after Shop Drawings and Product Data submittals have been accepted.

3. Finished manuals shall be heavy-duty loose-leaf type 3-ring binders with hardboard covers and titled tabs identifying each particular portion or item of Work.
    a. Provide binders with pocket folders for folded sheet information.
    b. Provide each binder a detailed Table of Contents referring to index tabs.
4. For each titled item or work portion, manual must provide names, addresses, and phone numbers of the following parties:
    a. Contractor/installer.
    b. Manufacturer.
    c. Nearest dealer/supplier.
    d. Nearest agency capable of supplying parts and service.
5. Each manual label on front cover or spine shall indicate the following information.
    a. Project name and address.
    b. Owner’s name.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of Subcontractor.
    f. Date of Submission.
6. Submit three copies of maintenance manuals to Architect for Owner's records.

G. Miscellaneous Record Submittals: Refer to other specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of final completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner’s records.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections include the following:

1. Drawings and general provisions of the Contract, including General and Special Conditions and other Division 01 Specification Sections, apply to this Section.
2. Section 01 31 00 – Project Management and Coordination for requirements for pre-instruction conferences.
3. Divisions 02 through 50 Sections for specific requirements for demonstration and training for products in those Sections.

1.02 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual(s) for Owner's use.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Demonstration and Training Videotapes: Submit two copies within seven Insert number days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Date videotape was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.03 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 - Quality Requirements, experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Management and Coordination. Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.04 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 – PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 – EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 – Operations and Maintenance Data.

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least ten days' advance notice.

D. Training Location and Reference Material: Conduct on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site.

G. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.03 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

D. Narration: Describe scenes on video recording by audio narration by microphone while dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

F. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION

SECTION 02 42 13

DECONSTRUCTION OF STRUCTURE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Dismantling the existing historic Bicentennial barn, and the inventory and organization of the salvaged components to facilitate the reconstruction of the barn on a new foundation at an adjacent location.
2. Inventorying all components of the barn structure to aid in reassembly.
3. Cleaning of barn components for reuse following disassembly.

B. Related Sections and Documents:

1. General Notes on Drawings.
2. Availability of scan documentation.
3. Section 01 11 00 – Summary of Work for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
4. Section 01 35 91 – Historic Treatment Procedures for historic removal and dismantling.
5. Section 01 73 00 – Execution for cutting and patching procedures.
6. Section 31 10 00 – Site Clearing for site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS

A. Catalog and Inventory documentation: identification system including physically marking item, photography, written and/or drawn documentation which adequately describe an element or assembly for reinstallation, restoration and/or replication purposes.

B. Deconstruction: The systematic dismantling and removal of a structure or its parts to salvage and harvest the components, with the purpose of reusing and recycling the reclaimed materials for their maximum value; the disassembly of a building with the explicit intent of recovering building materials for reuse in a safe and economical manner.

C. Dismantle: To disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby historic surfaces; and salvage of dismantled items off-site.

D. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.

E. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

F. Reuse: The subsequent use of a material, product, or component in generally the same manner as the original use, allowing for cleaning, repair, and/or repurposing.

G. Salvage: Removal of materials, products, or components from a building with the explicit intent of maintaining the materials' integrity, functionality, and value.

H. Salvage for Reinstallation: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

1.03 DECONSTRUCTION MEETING

A. Conduct meeting at project site.

1. Inspect and discuss condition of construction to be selectively deconstructed.
2. Review structural load limitations of existing structure.
3. Review and finalize deconstruction schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by deconstruction operations.

B. Survey and identify materials that are damaged, deteriorated, or otherwise unsuitable for reuse or recycling.

1.04 INFORMATIONAL SUBMITTALS

A. Work Plan:

1. Include the following in the Work Plan / Deconstruction Plan, as applied to the deconstruction Work.

a. Description of the deconstruction means, methods, techniques, and procedures to be applied dismantling the barn structure including the following:

1) Description of the specific approaches to be used in reuse and recycling of materials, components, and products generated during deconstruction, including the areas on site and equipment to be used for processing, sorting, and temporary storage of materials.
2) Characterization, including types and estimated quantities, of the materials and content present in the building(s) to be deconstructed.
3) List of specific materials, by type and quantity, which will be recovered for salvage and reuse.
4) Denailing and material processing and handling locations and methods.
5) Identification of materials that cannot be reused or recycled, with an explanation or justification.
6) Description of the means to protect materials recovered for reuse from contamination and physical and environmental damage.
7)

b. Deconstruction schedule; sequence and duration of activities.

1) Detailed sequence of deconstruction and removal work, with starting and ending dates for each activity

c. Labor and equipment applied to deconstructing the structure.
d. Identification of load-bearing components including:

1) Verification that vertical load bearing elements are sufficient to support deconstruction and equipment loads, and that roof and floor decks are suitable to perform as safe working platforms.
2) Structural safety hazards.
3) Methods to retain structural stability throughout the deconstruction process.

2. Site layout showing access to and use of the site during deconstruction Work.
3. Material handling and processing procedures.
4. Material loading and transportation procedures
5. Other information as requested by the Owner.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

C. Inventory: Submit a list of items to be removed prior to start of deconstruction.

D. Photographs of existing conditions: Prior to commencement of protection work, submit photographs of existing damage on surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to protection operations.

E. Qualification Data: Submit qualifications for firms and persons specified in "quality assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other' information specified.

1.05 QUALITY ASSURANCE

A. Regulatory requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Timber Frame Barn Contractor/Installer Qualifications: Possess all skills, qualifications, and experience required to deconstruct buildings, and effectively recover building materials. Such skills may reside either within the Contractor's organization or through subcontract, partnership, or similar association.

C. Deconstruction work shall be performed by experienced firms and individuals with a minimum of 5 comparable barn salvage and restoration experience projects over the past 10 years. Firms and individuals performing work of this section shall be skilled with specific protection processes and operations indicated.

1.06 PROJECT CONDITIONS

A. Historic building - Required care in protection operations.

1. The work seeks to preserve and restore an historic barn; and to protect, existing materials and items.
2. Building materials and items shall be considered fragile and must be handled with great care. Historic materials damaged during selective salvage and demolition operations may not be available for replacement; to remedy such damage repair and restoration shall be required. Protection of existing materials and items is of great importance.

B. Protection: construct temporary barricades and other forms of protection to fully protect existing building interior and all existing materials and items to remain.

1. Provide tree protection fencing and protect these areas from construction activities.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with deconstruction.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

PART 2 – PRODUCTS

2.01 STORAGE FACILITY

A. Storage and Protection: When taken from their existing locations, catalog and store historic items within a dry, weathertight enclosure where they are protected from wetting by rain, snow, condensation, or ground water, and from freezing temperatures.

1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.

2.02 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning deconstruction. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

B. Survey existing conditions and correlate with requirements indicated to determine extent of deconstruction required.

C. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during deconstruction operations.

1. Maintain fire-protection facilities in service during deconstruction operations.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, preconstruction videotapes and templates.

1. Comply with requirements specified in Section 01 32 33 – Photographic Documentation.
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before deconstruction or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner or Building Manager will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of deconstruction and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove components indicated to be removed.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct deconstruction and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01 50 00 – Temporary Facilities and Controls.

B. Temporary Protection Facilities:

1. Prior to the start of deconstruction, provide temporary construction barricades, to separate activities from the public for safety and liability protection.

2. Provide protection to ensure safe passage of people around deconstruction area.
3. Provide temporary weather protection, during interval between deconstruction of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of deconstruction.

3.04 PROTECTION, SALVAGE AND REMOVAL

A. Site perimeter: Protect the deconstruction jobsite perimeter from pedestrian access. Perimeter protection shall consist of chain link, wire mesh, or similar continuous barrier material a minimum of 60 inches high.

B. During deconstruction, continuously evaluate the condition of the structure being dismantled and take immediate action to protect all personnel working in and around the structure.

1. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element shall be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while personnel perform work in the immediate area.
2. Ensure no unstable elements are left unsupported, which may include but are not limited to elements that are compromised by physical damage, deterioration, or damage by organisms.
3. Place and secure bracing, shoring, or lateral support as required as a result of any cutting, removal, or deconstruction work.

C. Protection:

1. Construct temporary protection at existing elements indicated to remain, to prevent damage to or marring of materials and items. Protection shall be of required size and thickness to withstand impact from falling debris, rolling equipment and objects; residue and droppings from all construction related activities.
2. Provide temporary shoring and scaffolding which does not damage historic fabric.
3. Monitor areas indicated to be protected by prohibiting passage and construction activities, except for selected work required therein.
4. Allow site access only at the designated locations. Secure access locations after working hours and when not supervised during working hours.
5. Provide signs at all access locations requiring all personnel to wear personal protective equipment while on the jobsite.

D. Protection Offsite: Where indicated to be "removed, salvaged and reinstalled" and "removed and salvaged", carefully remove indicated materials and items, and pack or crate for transport to storage area or facility. Maintain storage area or facility for the duration of the project.

3.05 DECONSTRUCTION, GENERAL

A. General: Dismantle existing construction to the extent required for salvage and reuse of construction components. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with deconstruction systematically, from higher to lower level. Complete deconstruction operations above each floor or tier before disturbing supporting members on the next lower level.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
4. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
5. Mark pieces and identify pieces on exterior surfaces (unexposed) for inventory and reassembly, with markings concealed in finished work so as not to be evident.
6. Locate deconstruction equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Salvaged Construction Materials for Reinstallation:

1. Where Work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
2. Clean items of loose debris and to prepare to an extent as approved in a mockup by the Architect for reuse for the reconstruction.
3. Mark pieces for inventory and reassembly.
4. Pack or crate items after cleaning. Label contents of containers.
5. Protect items from damage during transport and storage.
6. Transport items to Owner's storage area on-site or in off-site facility. Store items in a secure area.
7. Prepare components for reassembly. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

3.06 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and Remove

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be salvaged for reconstruction or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Comply with requirements specified in Section 01 77 00 – Closeout Procedures.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.08 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by deconstruction operations. Return adjacent areas to condition existing before deconstruction operations began.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Basic Specification: Perform work of this Section according to ACI 301-10, "Specifications for Structural Concrete," except as specifically modified herein. Numbers in parentheses (0.00) indicate a related paragraph of ACI 301.

B. Section Includes: All cast-in-place concrete shown on the Drawings and required by these Specifications. Allow for the installation of cast-in-place items furnished under other Sections. Install anchor bolts for structural steel. Provide and install grout under steel column base plates and beam bearing areas.

C. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

D. Coordinate the work of other trades who will provide and install items (sleeves, piping, conduit, inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.

E. Dimensions of chases and openings, and details of connections and supports related to equipment as shown on the Drawings are for bidding only. Verify sizes, locations, and details prior to placing concrete.

F. Inspection and testing services required to establish mix designs are to be performed by an agency retained by the Contractor (1.6.2 and 1.6.3). Other services required by this Section are to be performed by an agency retained by the Owner. Provide facilities for storage and curing of specimens molded by the Owner's agency (1.6.2.2.d).

G. Related Sections: Carefully examine all other Sections and all Drawings for related work which includes but is not limited to:
1. Division 04, Masonry
2. Section 05 12 00, "Structural Steel"
3. Section 05 30 00, "Metal Decking"
4. Section ***** Division 07, Sealants
5. Section ***** Division 07, Moisture Protection

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. ACI 117-14 Specifications for Tolerances for Concrete Construction and Materials.
2. ACI Detailing Manual, SP66(04).

3. CRSI "Code of Standard Practice," 2009, 28th edition.
4. WRI "Manual of Standard Practice" July 2010, 8th edition.

1.03 SUBMITTALS

A. Submit for approval the name of the agency proposed for the required inspection and testing services. All of the required field testing and sampling is to be performed by personnel employed by the proposed agency.

B. Submit a mix design for each class of concrete required (1.6.2.2.a). Submittals to comply with appropriate methods in ACI 301-10 (4.2.3). Indicate whether mixes have been designed for pumping.

C. Submit shop drawings for all reinforcing. Indicate strength, size, and details of all bar reinforcing, and style and specification of all welded wire fabric (3.1.1). Notwithstanding any other requirements specified elsewhere in these specifications, one electronic copy of the drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.

D. Submit, on request only, product literature for admixtures and curing compounds proposed for use.

E. Submit reports of all required testing and inspection.

F. Submit, on request only, mill test certificates for reinforcing.

G. Submit for approval proposed spacing and location of construction and/or control joints in concrete slabs on grade. Include coordinated layout locating all embedded electrical floor boxes, floor drains, recesses, and trenches in the submittal.

1.04 FIELD REFERENCE MANUALS

A. Provide at least one (1) copy of the ACI Field Reference Manual, SP-15(16), and one (1) copy of CRSI's "Code of Standard Practice" in the field office at all times (1.3.3).

PART 2 PRODUCTS

2.01 MATERIALS

A. Cementitious Material (4.2.1.1):
   1. Portland Limestone Cement: ASTM C595, Type IL
   2. Ground Granulated Blast-Furnace Slag (GGBF): ASTM C989/C989M-18a, Grade 100 or higher. GGBF can be substituted for Portland cement up to a maximum of 30% by mass.
   3. Fly Ash or Pozzolans: ASTM C618-19, Class F. Maximum loss on ignition 3%.

B. Water: Potable, conforming to ASTM C94/C94M-18 (4.2.1.3).

C. Aggregates:
   1. Conform to ASTM C33/C33M-18 (4.2.1.2).
   2. Coarse Aggregate Size:
      a. No. 57 unless otherwise indicated.

D. Admixtures (where required or permitted) (4.2.1.4):
   1. Water-Reducing: ASTM C494/C494M-17, Type A and D.
   2. Superplasticizer (High Range Water Reducer): ASTM C494/C494M-17, Type F or G. Acceptable products include, but are not limited to:
      a. Eucon 37 by Euclid Chemical Company.
      b. Sikament 686 by Sika Corporation.
      c. Master Rheobuild 1000 by BASF.
      d. Daracem 19 by GCP Applied Technologies.
   3. Superplasticizer (High Range Water Reducer) (Polycarboxylates): ASTM C494/C494M-17, Type A and F. Acceptable products include, but are not limited to:
      a. Plastol 5000 by Euclid.
      b. Adva 140M by GCP Applied Technologies.
      c. ViscoCrete 4100 by Sika.
      d. MasterGlenium 3030 by BASF.
   4. Mid-range Water Reducer: ASTM C494/C494M-17, Type A or G. Acceptable products include, but are not limited to:
      a. SikaPlast 200 or Sikaplast 300 GP by Sika.
      b. Eucon MR by Euclid.
      c. Master Polyheed 900 by BASF.
      d. Mira 35 by GCP Applied Technologies.
   5. Air-Entraining: ASTM C260/C260M-10a(2016).
   6. Accelerating: ASTM C494/C494M-17, Type C or E, containing no more chlorides than are present in municipal drinking water. Acceptable products include, but are not limited to:
      a. Accelguard 90 by Euclid.
      b. MasterSet FP20 by BASF.
      c. Plastocrete 161HE by Sika Corporation.
      d. PolarSet by GCP Applied Technologies.
   7. Synthetic Fiber Reinforcement: ASTM C1116/C1116M-10a(2015). Acceptable products include, but are not limited:
      a. Nycon RC Nylon Fibers or Procon-M Polypropylene Fibers by Nycon.
      b. Nylo-Mono Nylon Fibers or Mighty-Mono Polypropylene Fibers by Forta
      c. Fibermesh 150 F Polypropylene Fibers by Propex.
      d. Sinta F19 or Sinta M2219 by GCP Applied Technologies
      e. PSI Fiberstrand 150 by Euclid.
   8. Calcium chloride is NOT permitted (4.2.1.4).
   9. Upon request only, provide a qualified full-time representative to assure proper use of admixtures.
   10. Use of admixtures other than listed above will be permitted only when approved prior to use.

E. Reinforcing (3.2.1):
   1. Deformed Bars: ASTM A615/A615M-18e1, A996/A996M-16 (bars from rail steel shall be Type R) or A706/A706M-16. Minimum yield strength to be 60 ksi. Bars to be welded shall conform to ASTM A706.

2. Welded Wire Fabric: ASTM A1064/A1064M-18a. Provide in sheet form (not rolls). Where this is used, except in slabs on grade, it is designed as load-carrying reinforcement (3.2.1.6).

F. Preformed Expansion Joint Filler: ASTM D1751-18 (2.2.1.4).
1. Acceptable products include, but are not limited to:
   a. Fibre or Ceramar by W.R. Meadows.
   b. A.P.S. Fiber Board by A.P.S.
   c. Fibre Expansion Joints by Atlas Construction Supply

G. Curing Compound: Comply with ASTM C309-19, Type 1, Class B (clear). Compound shall comply with EPA's VOC requirements. Must be compatible with adhesive specified for floor finishes.

H. Curing and Sealing Compound: Comply with ASTM C1315-19. Type I Class A (clear) Compound shall comply with EPA's VOC requirements. Apply at the manufacturer's written recommended application rate. Must be compatible with adhesive specified for floor finishes.

I. Grout for Masonry Core Fill: ASTM C476-18, coarse type or fine type, per ACI 530.1-13, Table 5.

J. Non-shrink Grout under Bearing Elements: Conform to Corps of Engineers Specification CRD-C621-88 and ASTM C1107/C1107M-17 Grade B or C. Acceptable products include, but are not limited to:
1. L&M Crystex by Laticrete.
2. NS Grout by Euclid.
3. Sikagrout 212 by Sika.
4. 1107 Advantage Grout by Dayton Superior.
5. SureGrout by Kaufman Products, Inc.
6. Kemset Grout by ChemMasters.

K. Dovetail Slots: Galvanized steel, 24 ga. minimum.

L. Bonding Agent: No thinner than 75 square feet per gallon. Acceptable products include, but are not limited to:
1. Euco #452MV by Euclid.
2. Sikadur 32 Hi-Mod by Sika.
3. Sure-Poxy HM by Kaufman Products.
4. Sure Bond J58 by Dayton Superior

M. Vapor Barrier: 10 mil clear polyethylene.

N. Sealer: Clear membrane-forming compound which will not yellow. Must be formulated for the intended application, either interior or exterior and applied per the manufacturer's written recommendations. Must comply with EPA's VOC requirements and be compatible with the curing compound used.

O. Joint Sealant: Use 1-component polyurethane conforming to ASTM C920-18, Type S, Grade NS, Class 25. Use with backer rod as required. Acceptable products include, but are not limited to:
   1. Eucolastic 1NS by Euclid.
   2. Sikaflex-1a by Sika.
   3. Dymonic 100 by Tremco.

P. Keyed Floor Slab Joints: Mill galvanized steel, 20 gauge minimum, with minimum key dimensions of 3/4 inch deep by 1 1/2 inches at its widest point. Acceptable products include, but are not limited to:
   1. Tongue & Groove Joint 95 by Heckmann Building Products, Inc.
   2. G-33 Screed Key Joint by Dayton Superior

Q. Preformed Adhesive Waterstop: Conform to Federal Specification SSS-210. Acceptable products include but are not limited to:
   1. Conseal CS202 by Concrete Sealants, Inc.
   2. Synko-Flex by Henry Company.
   3. Ultrastop by Vinylex
   4. Lock Stop by Sika Greenstreak

R. Waterstops: Premolded, flexible, polyvinylchloride, conforming to CRD-572 (2.2.1.5).

S. Paper Curing Membranes Conforming to ASTM C171-16:
   1. Orange Label Sisalkraft by Henry Company
   2. Blue Shield 3560 by Holland
   3. Ultra Cure NCF by Sika

2.02 MIXES

A. The following classes of concrete are required (4.2.2.8):
   1. Class I - Footings, piers, drilled shafts, pile caps, grade beams and underpinning. Minimum f'c=3000 psi.
   2. Class II - Interior slabs on grade, fill on composite floor deck, fill over metal centering, walls, and all interior concrete not otherwise identified. Minimum f'c=3500 psi, water-reducer required. Minimum cementitious material content 517 lbs. per cubic yard. Maximum water-cementitious material ratio 0.45. All Class II concrete used for interior slabs on grade shall have synthetic fiber reinforcement.
   3. Class IIA – Polished/sealed interior slabs on grade exposed to public view. Minimum f'c=3500 psfi, water-reducer required. Minimum cementitious material content 517 lbs. per cubic yard. Maximum water-cementitious material ratio 0.45. No pozzolans or fibers are to be used.
   4. Class III - Exterior slabs on grade, retaining walls, basement walls, piers and columns placed integrally with basement walls, and all exterior concrete not otherwise identified. Minimum f'c=4500 psi, air-entraining admixture and water-reducer required. Minimum cementitious material content 564 lbs. per cubic yard. Maximum water-cementitious material ratio 0.45, air content 6+1, -1.5% (4.2.2.4).
   5. Class IV - Backfill below footings. Controlled Density Fill (CDF) 300 psi.

B. Pozzolans are permitted in all Classes except for Class IIA.

C. Class IV concrete may be site mixed; all other concrete is to be ready-mixed (4.3.1). All admixtures are to be added at the batch plant, except that superplasticizer, if used, is to be added at the site. Superplasticizer/retarder can be added at the batch plant.

D. Concrete used for floors (Classes II and IIA) is to have a minimum three (3) day compressive strength of 1800 psi.

E. Slump:
1. Design concrete mixes for a maximum slump of 4 inches, unless a superplasticizer is to be used.
2. If a superplasticizer is to be used, design mixes for a slump of 2 inches - 4 inches before its addition; maximum slump permitted after its addition is 8 inches.

F. Synthetic fiber reinforcement shall be used in strict accordance with the manufacturer's recommendations. Dosage rate shall be as recommended by the manufacturer, but not less than 1 lb. per cubic yard.

G. No air entraining admixture is required unless an air content is specified (4.2.2.4).

H. Concrete mixes shall not contain any deleterious or other reactive aggregates or materials that can initiate and promote alkali silica reaction (ASR).

PART 3 EXECUTION

3.01 ERECTION

A. This structure is designed to be self-supporting and stable after the building is fully completed. It is solely the Contractor's responsibility to determine erection procedures and sequence, and to ensure the stability of the building and its component parts, and the adequacy of temporary or incomplete connections, during erection. This includes the addition of any shoring, sheeting, temporary guys, bracing or tie-downs that might be necessary. Such material is not shown on the Drawings. If applied, they shall be removed as conditions permit, and shall remain the Contractor's property.

3.02 SURFACE CONDITIONS

A. Verify that excavations are free of water and ice, are of the required dimensions, and have been approved by the testing agency responsible for soils inspection, prior to placing concrete (5.3.1).

B. Determine field conditions by actual measurement.

C. Notify the Architect not less than 24 hours in advance of placing concrete. Place concrete only when the Architect is present, unless this requirement is specifically waived.

D. Prior to application of sealer, remove any synthetic fiber reinforcement projecting above the top surface of slabs which remain exposed.

3.03 FORMWORK, METAL DECK AND REINFORCING

A. Footings may be cast against earth cuts when soil conditions permit (2.2.2.3).

B. For pan joist floors which receive no ceiling, use new or newly reconditioned pans, carefully aligned such that major irregularities and abrupt changes in section are avoided.

C. Reinforcing:
1. Welding of reinforcing is prohibited, except where shown. All welding of reinforcing shall conform to AWS D1.4/1.4M:2018.
2. Provide support bars and other devices as required to maintain alignment of scheduled reinforcing. Note that such supports are not generally shown on the Drawings, but are the Contractor's responsibility, and are to be included in the bid. They are not to be counted as satisfying any part of the requirement for "contingency" reinforcing (see Structural Notes on Drawings).
3. At the Contractor's option, welded wire fabric can be substituted for deformed bars if the welded wire fabric is approved by the Engineer.

D. Removal of Forms and Shoring:
1. Remove no forms within first 24 hours after placement for supported slabs and 12 hours for columns and walls.
2. When non-post-tensioned structure is to be reshored, forms may be removed when the concrete attains 75% of its design strength.
3. Remove all shoring prior to constructing masonry walls supported by the structure.

E. Metal deck is designed for a 20 psf construction load. If this load will be exceeded by bulk dumping or motorized finishing equipment, notify the metal deck supplier. Cost of increasing the deck gage shall be at the concrete placing contractor’s expense.

3.04 EMBEDDED ITEMS

A. Install embedded conduit, pipes, sleeves and anchor bolts subject to the following limitations:
1. Do not embed aluminum without prior approval of coating material.
2. Do not displace reinforcing steel.
3. In slabs, walls, and beams, limit outside dimension of conduits and pipes to 1/3 member thickness. For slabs over metal decks, thickness is measured from the top of the metal deck.
4. In columns, limit total area of pipes and conduit to 4% of column area.
5. Maintain a center-to-center spacing of at least 3 diameters of conduit, pipe or sleeve.
6. Install anchor bolts for base plates of steel elements according to tolerances of AISC Code of Standard Practice for Steel Buildings and Bridges, April 14, 2010, Paragraph 7.5.

B. Vapor Barrier:
1. Under leveled base at all interior slabs on grade, place one (1) layer of vapor barrier material, lapping edges 6 inches.
2. Lap and seal all joints; seal edges to all walls, column bases, etc.; fold and cement corners or otherwise make vaporproof.
3. Provide sealed contact with piping and all penetrating items.

3.05 DELIVERY AND PLACEMENT

A. Preparation Before Placement:
   1. Remove all debris from forms and deck. Clean steel deck of grease, oil, and other substances which would reduce bond to concrete.
   2. Do not use additives or salts to remove ice.
   3. In cold weather, maintain temperature of forms and reinforcing such that concrete temperature can be kept within the specified range.

B. Delivery:
   1. Conform to ASTM C94/C94M-18.
   2. Delivery tickets to contain the following, in addition to the information required by C94:
      a. Reading of revolution counter at first addition of water.
      b. Type and brand of cement.
      c. Amount of cement.
      d. Total water content by producer.
      e. Maximum size of aggregate.
   3. Secure the Architect's written approval if non-agitating type equipment is to be used for transportation.
   4. Water may be added at the site only with the Architect's prior approval. Secure the Architect's signature on the delivery ticket which indicates the quantity of water added.
   5. ASTM C94 requires discharge within 1 1/2 hours or 300 revolutions, whichever occurs first, after the introduction of water to cement and aggregates, or the introduction of cement to the aggregates (4.3.2.2). The Architect may require an earlier discharge during hot weather or when high-early strength cement is being used.
   6. Place concrete at the maximum slump for which the mix was designed with a tolerance of up to 1 inch above the maximum for one (1) batch in any five (5) consecutive batches tested (4.3.2.1).

C. Conveying: Keep delivery carts and buggies on runways; do not allow them to bear on reinforcing or uncured concrete.

D. Placement:
   1. Place within 6 feet of final position. Spreading with vibrators is prohibited.
   2. In walls and columns, deposit concrete in uniform horizontal layers with a maximum depth of 5 feet.
   3. Maximum free fall without chutes or elephant trunks to be 5 feet.

E. Records: Keep a complete log of pours, including date, location, quantity, weather, and identification of test cylinders, for each pour.

3.06 JOINTING

A. Interior Slabs on Grade:
   1. Locate control and construction joints as shown on the Drawings. In the absence of information on the Drawings, locate at openings, walls, columns, grid lines, inside corners, and at 15 feet on center generally. Schedule slab pours and sawcutting operations such that sawing is completed prior to onset of shrinkage cracking. Complete saw cutting within 12 hours after placement (5.3.5).

2. Provide isolation joints at columns (1/2 inch thick) and at walls (1/4 inch thick). Where isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal to the filler thickness to receive sealant. Where not exposed to view, set top of filler flush with top of slab.
3. Where joints are exposed to view in the finished building, provide joint sealant.

B. Exterior Slabs on Grade: Locate joints as shown on the Drawings. In the absence of information on the Drawings, provide the following:
1. Expansion Joints: Full depth, with 1/2 inch joint filler, where slabs abut vertical surfaces, at intersections of sidewalks, at abrupt changes in width, and at a spacing not exceeding 30 feet.
2. Control Joints: Tooled, 7/8 inch deep, 4 feet to 6 feet on center between expansion joints.

3.07 FINISHES

A. Schedule of finishes on flatwork is as follows:
1. Troweled finish: typical interior floor areas to receive adhesive-applied finish, or carpet, or to remain exposed (5.3.4.2.c).
2. Floated finish: interior floor areas to receive finish in cementitious setting bed (5.3.4.2.b).
3. Broom finish: exterior slabs (5.3.4.2.d).
4. All driving and parking areas: broom finish (5.3.4.2.d).
5. Areas indicated on Drawings:

B. Schedule of finishes on formed surfaces is as follows:
1. Rough form finish: beams, slabs, joists, and other surfaces not otherwise specified. SF – 1.0. (5.3.3.3.a).
2. Smooth form finish surface class B: walls, columns, and other surfaces exposed to public view or scheduled to receive waterproofing SF – 2.0. (5.3.3.3.b).

3.08 FINISHING TOLERANCES

A. Conform to F-number requirements noted below and as described in ASTM E1155-14 for all interior slabs (5.3.4.3.c):
1. All interior slabs on grade and all interior shored elevated slabs: F_F-25/FL-20 minimum overall for composite of all measured values; F_F-18/FL-13 minimum for any individual floor section.
2. All other interior slabs: F_F-25 minimum overall for composite of all measured values; F_F-18 minimum for any individual section.

B. Take remedial measures if flatness and levelness testing indicates either of the following conditions exist:
1. The entire floor composite value, when installation is complete, measures less than either of the specified overall F-numbers.
2. Any individual floor section measures less than either of the specified minimum section F-numbers.

C. Obtain written approval of the Architect and Engineer of remedial measures proposed before implementing measures.

D. All exterior slabs shall be finished to a 1/2 inch in 10 foot tolerance.

E. All driving and parking areas shall be finished to a 1/4 inch in 10 foot tolerance.

3.09 CURING AND PROTECTION

A. Temperature:
1. When air temperature during placement is less than 40 degrees F, or will be within 24 hours, temperature of concrete as placed is to be between 50 and 90 degrees F (55 and 90 degrees F for sections less than 12 inches thick). Maintain concrete temperature within these limits for the full curing period of seven (7) days (or three (3) days for high-early-strength concrete) (4.2.2.6).
2. The temperature of concrete as delivered shall not exceed 90 degrees F (4.2.2.6).

B. Curing:
1. Interior slab areas which will receive finish in cementitious setting bed or to receive adhesive applied finishes are to be cured using paper curing membranes without the use of a curing compound (5.3.6.4.a through 5.3.6.4.d).
2. All other slab areas may be either moist-cured or receive an application of curing compound (5.3.6.4.e).
3. Whichever curing method is used, it is to commence immediately after disappearance of water sheen and continue for at least seven days. Cure high-early-strength concrete for a minimum of three (3) days (5.3.6.1). Do not allow curing to be delayed overnight.
4. Prevent excessive moisture loss from formed surfaces (5.3.6.3). If forms are removed before seven (7) days have elapsed, cure the formed surfaces by moist-curing or application of curing compound for the remainder of the curing period.
5. All exterior slabs are to receive an application of sealer prior to completion of construction.
6. Interior slabs which remain exposed are to receive an application of sealer prior to the completion of construction.

3.10 GROUTING

A. Grout below bearing plates, setting plates, and column base plates is to be installed only after the steel is plumbed. The use of leveling plates at column bases is prohibited.

B. Install grout per the recommendations of the manufacturer.

3.11 FIELD QUALITY CONTROL

A. Obtain concrete for required tests at point of placement (1.6.3.2).

B. For each concrete class, except Class IV, perform one strength test for each 50 yards, or fraction thereof, placed in any one day (1.6.3.2.d and 1.6.3.2.e).

C. Determine slump for each strength test (1.6.3.2.d).

D. Air Content:
1. Determine air content for each strength test of air-entrained concrete per ASTM C231/C231M-17a, C173/C173M-16 or C138/138M-17a (1.6.3.2.g).

2. At first strength test of air-entrained flatwork in any one day, calibrate a hand-held air indicator with a sample from the same batch.
3. At least twice each day when air-entrained flatwork is being placed, monitor the air content using the hand-held indicator, after floating. If air content of slab is more than 1/2% lower than at the chute, revise finishing procedure to correct the situation.

E. Determine concrete temperature for each strength test when air temperature is less than 40 degrees, or will be within 24 hours (1.6.3.2.d).

F. Do not place concrete when slump, air content, or temperature vary from allowable.

G. Test interior floor slab finished surfaces for flatness and levelness in accordance with ASTM E1155-14(5.3.4.3.c).

H. Individual floor sections for floor tolerance testing purposes shall be bound by the following that provide the smallest sections: construction joints, control joints, column lines and half-column lines.

I. Each individual floor cast in a single day shall meet the composite flatness requirements.

J. Floor tolerance tests shall typically be performed (and all defective areas identified) within 24 hours after slab placement and reported to all parties as soon as possible, but not later than 72 hours after installation. At areas cured with a paper curing membrane, floor tolerance tests shall be performed immediately following its removal. Shored elevated slabs shall be tested prior to removal of shoring.

K. Visual inspections:
1. Periodically inspect reinforcing steel for size, location and placement.
2. Continuously inspect reinforcing to be welded.
3. Continuously inspect anchor bolts cast into concrete.
4. Periodically verify the use of the required design mix.
5. Continuously inspect the placement of the concrete for proper techniques. Periodically inspect for maintenance of specified curing temperature and techniques.
6. Periodically inspect concrete formwork for shape, location and dimensions of members.

L. Maintain records of all tests, indicating exact location of the structure represented by each test.

END OF SECTION

SECTION 03 35 43

STAINED CONCRETE FINISHING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Grinding of the slab surface to receive clear reactive, penetrating liquid hardener/densifier.
2. Application of clear reactive, penetrating liquid hardener and concrete dye.
3. Progressively polishing and burnishing of the slab surface to achieve Finish Requirements.
4. Application of stain resistant surface treatment.

B. Related Requirements:

1. Section 03 30 00 – Cast-in-Place Concrete for concrete floors.

1.02 REFERENCES

A. American National Standard Institute / National Floor Safety Institute ANSI/NSFI B101.1 Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

1.03 DEFINITIONS

A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Pre-Installation Meeting: Convene before the start of work on new concrete slabs, patching of existing concrete slabs and start of application of concrete finish system.
2. Require attendance of parties directly affecting work of this Section, including the Owner's Representative, Contractor, Architect, concrete installer, and applicator. Meeting should only convene when required parties are present.
3. Review the following:

   a. Physical requirements of completed concrete slab and slab finish.
   b. Locations and time of test areas.
   c. Protection of surfaces not scheduled for finish application.
   d. Surface preparation.
   e. Application procedure.
   f. Final appearance of dyed concrete.
   g. Quality control.
   h. Cleaning.
   i. Protection of finish system.
   j. Coordination with other work.

1.05 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

1. Product Data: For each type of product.
2. Samples for Initial Selection: For each type of product requiring color selection.
3. Samples for Verification: For each type of exposed color.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Repair materials.
2. Stain materials.
3. Concrete sealer.

1.07 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years' experience producing concrete coatings.

B. Installer Qualifications:

1. Applicator to be familiar with the specified requirements and the methods needed for proper performance of work of this section. Applicator must have availability of proper equipment to perform work within scope of this project on a timely basis. Applicator should have successfully performed a minimum of 5 projects of similar scope and complexity

C. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches (1200 by 1200 mm) minimum, to demonstrate the expected range of finish, color, and appearance variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
3. Demolish and remove field sample panels when directed.

D. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Notify the above parties one week in advance of date and time when mock-up will be completed.
2. Require attendance of parties directly affecting work of this Section, including the Contractor, Architect, applicator, and Owner's Representative.
3. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
4. Multiple mock-ups may be required until desired finish is achieved.
5. Demonstrate the materials, equipment and application methods to be used for work specified herein in pre-approved location approximately 50 sq. ft. in area or as directed by the [Architect][Owner's Representative].
6. Retain approved mock-up during construction as a standard for judging the completed work. Areas may remain as part of the completed work.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.

B. Store concrete hardener/densifier and surface protectant treatment in environment recommended on published manufacturer's product data sheets.

1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 40 and 100 degrees F (4 and 38 degrees C).
2. Protect from freezing.
3. Store away from other chemicals and potential sources of contamination.
4. Keep lights, fire, sparks and heat away from containers.
5. Do not drop containers or slide across sharp objects.
6. Do not stack pallets more than three high.
7. Keep containers tightly closed when not in use.

1.09 PROJECT CONDITIONS

A. Environmental limitations:

1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance and finishing requirements.

B. Close areas to traffic during floor application and after application for time period recommended in writing by manufacturer.

C. Protect the completed slab to prevent damage by the other trades during floor completion.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pre-Densifier Concrete Cleaner: Cleaner to remove dirt, oil, grease, and other stains from existing slab surface.

1. Product: Consolideck Cleaner/Degreaser manufactured by PROSOCO, Inc., Lawrence, KS.

B. Penetrating Concrete Hardener/Densifier: Lithium silicate hardener/densifier.

1. Product: Consolideck LS, manufactured by PROSOCO, Inc.
2. Coefficient of Friction: Greater than 0.60 dry, Greater than 0.60 wet when tested in accordance with ASTM C1028.
3. Adhesion: Greater than 10 percent increase in pull-off strength when compared to an untreated sample when tested in accordance with ASTM D4541.
4. Water Vapor Transmission: 100 percent retained when compared to untreated samples when tested in accordance with ASTM E96/96M Method B (Water Method).
5. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

C. Translucent Concrete Dye: General Purpose water-carried, penetrating, translucent colored dye.

1. Product: Consolideck GemTone Stain manufactured by PROSOCO Inc.

D. Interior Concrete Protective Treatments:

1. General Purpose medium gloss film forming premium sealer, lithium silicate hardener/densifier.

a. Product: Consolideck PolishGuard, manufactured by PROSOCO, Inc.

2. Coefficient of Friction: Greater than 0.60 dry, greater than 0.60 wet when tested in accordance with ASTM C1028.
3. Stain Resistance: Achieve limited or no adverse effects when tested in accordance with ASTM D1038.
4. UV Stability: No degradation or yellowing of material when tested in accordance with ASTM G154.

2.02 EQUIPMENT

A. Auto Scrubber Machine: For cleaning operations.

B. Hand Grinder or stand-up edger for edge grinding/polishing.

C. Polishing Equipment:

1. Dry grinding/polishing machines shall include a dust extraction system, including HEPA filtration vacuum.

D. Diamond Segments:

1. Use heads from the same manufacturers throughout the entirety of the project.

E. Diamond Heads Types:

1. Metal Diamonds: 60, 80 or 150.
2. Hybrid Style Diamonds: 50 or 100.
3. Resin Bonded, Phenolic Diamonds: 100, 200, 400, 800, 1300 and 3000 (if necessary).

F. Burnishing Machine and Burnishing Pads to produce specified results.

1. Burnishing Machine: High speed burnisher, generating pad speeds of 1,500 RPM or higher, as recommended by protective treatment manufacturer. Dust skirt must be installed at time of work.
2. Burnishing Pads: as recommended by protective treatment manufacturer.

a. White Burnishing Pad, non-abrasive,

b. Consolideck Heat Pad manufactured by PROSOCO, Inc

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrate with installer present for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

A. Clean dirt, dust, oil, grease and other contaminants that interfere with penetration or performance of specified product from surfaces. Use appropriate concrete cleaners approved by the concrete surface treatment manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of product.

B. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of product.

C. Variations in substrate texture and color will affect final appearance and should be corrected prior to application of sealer/hardener system and the polishing steps.

D. Protect surrounding areas prior to application. If product is accidentally misapplied to adjacent surfaces, flush with water immediately before material dries.

E. Avoid contact in areas not to be treated. Avoid contact with metal, glass and painted surfaces.

F. Seal open joints in accordance with Section 07 92 00 –Joint Sealants.

G. Apply specified sealants and caulking and allow complete curing before application of penetrating concrete hardener/densifier.

H. Do not proceed until unsatisfactory conditions have been corrected.

3.03 CONCRETE POLISHING

A. Adhere to industry standard polishing procedures for dry and wet grinding/polishing is acceptable when industry standard polishing procedures are adhered to.

B. Scrub and rinse slab surface with clean water and vacuum with auto-scrubber between and after final polishing passes.

C. Sequential progression of diamond polishing steps shall be required and limited to no more than double the grit value of the previous diamonds used.

D. Overlap adjacent polishing passes by 25 percent

E. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.

F. Progressively grind and polish the slab surface utilizing approved diamond segments as necessary to produce Finishing requirements.

3.04 APPLICATION OF PENETRATING TRANSLUCENT DYE AND CONCRETE HARDENER/DENSIFIER

A. Dilute translucent dye with fresh water, or other approved solvent as recommended by manufacturer to create desired color. (Apply within 24 hours of dilution).

B. Lightly wet a clean microfiber pad with diluted translucent concrete dye, leaving the pad damp and spray apply prepared diluted translucent dye to the clean, dry concrete per manufacturer’s recommendations.

C. Using pre-wet microfiber pad, immediately spread the spray-applied diluted translucent dye to ensure uniform wetting and color distribution.

1. Allow treated surface to dry for one hour minimum prior to walking on or auto scrubbing.
2. Remove excess stain residue by cleaning slab with auto scrubber or dry burnisher and allow treated surface to dry.

D. Dry polish floor with 400 grit resin diamonds.

E. Clean slab with auto scrubber and allow surface to dry.

F. Apply second coat of penetrating diluted translucent dye, if desired. (Repeating above steps A through C) Allow treated surface to dry for one hour minimum prior to auto scrubbing or burnishing (As an alternative, both coats of dye may be applied at 400 grit, waiting one hour after each coat prior to auto-scrubbing or burnishing).

G. Remove excess stain residue by cleaning slab with auto scrubber or dry burnisher and allow treated surface to dry.

H. Apply a single coat of hardener/densifier with a low pressure sprayer.

1. Apply sufficient material to wet the surface without producing puddles. Use a clean soft-bristle push broom or microfiber pad to spread the hardener/densifier evenly to achieve uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.

I. Allow treated surface to dry.

J. Continue progressively dry polishing floor with required resin diamonds to produce desired final finish.

3.05 APPLICATION OF INTERIOR CONCRETE PROTECTIVE TREATMENT

A. Apply general purpose medium gloss protective treatment per manufacturer’s published recommendations to clean, dry slab at the completion of mechanically polishing the slab surface.

B. Spray-apply protective treatment. Work from one control joint to another.

C. Spread two coats with the damp microfiber pad. Maintain a thin, even coating and wet edge.

3.06 SLAB PROTECTION

A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession.

B. Do not drag or drop equipment or material across the slab which will scratch or chip it.

C. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.

D. Clean up spills on slab immediately. Provide cleaning chemicals and absorptive materials.

E. Develop a concrete protection procedure which addresses the following procedures:

1. Communication of protection plan to subcontractors and vendors.
2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.

F. Provide a clean slab using concrete maintenance cleaner within an auto scrubber, equipped with soft nylon brushes, in accordance with manufacturer's recommendations

3.07 FINISHING APPEARANCE

A. Interior exposed colored finished slab areas must meet the desired sheen and color, as discussed in Pre-Installation meeting and be consistent with approved Mock-up.

3.08 CLEANING AND PROTECTION

A. Protection: Do not cover, but protect floor area from paint and other contaminates that could inhibit the stain.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and materials required to furnish and install the structural steel shown on the Drawings and required by these Specifications, including that shown on mechanical or electrical Drawings, or required in their Specification Sections.

B. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

C. Related Sections: Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
1. Section 03 30 00, "Cast-in-Place Concrete"
2. Section 05 30 00, "Metal Decking"

D. Work Furnished but Installed Under Other Sections: Anchor bolts, loose bearing and base plates, and loose lintels.

E. Work Affected by Others: Framing, loads, openings, and structure in any way related to plumbing, HVAC, or electrical requirements is shown for bidding purposes only. Responsibility for coordinating the work of this Section with these requirements is solely that of the Contractor. Contractor's review of shop Drawings will be taken to indicate that this coordination has been accomplished.

F. Inspection and testing required by this Section to be at the Owner's expense.

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. By the American Institute of Steel Construction (AISC):
   a. Specification for Structural Steel Buildings (June 22, 2010).
   b. Specification for Structural Joints using High-Strength Bolts (December 31, 2009).
   c. Code of Standard Practice for Steel Buildings and Bridges (April 14, 2010).
2. By the American Welding Society (AWS):
   a. Structural Welding Code – Steel AWS D1.1/D1.1M:2015, Paragraph 6.6.5 specifically excluded.
   b. Symbols for Welding and Non-Destructive Testing AWS A2.4:2012.

B. Fabricator's Qualifications:
1. Minimum five (5) years' continuous experience in the fabrication of steel for projects of similar quality and scope.

2. Certification Standard for Steel Building Structures (STD) in accordance with the American Institute of Steel Construction.

C. Erector's Qualifications: Minimum five (5) years' continuous experience in similar steel erection.

D. Welders' Qualifications: Personnel and procedures are to be qualified in accordance with AWS D1.1/D1.1M:2015.

E. Inspection Agency's Qualifications: Minimum three (3) years' experience in similar steel inspection, and approval of the Architect.

1.03 SUBMITTALS

A. Steel Fabricator's and Contractor's Certification: The following certifications shall be placed on the front cover of, or on the initial sheet of each steel fabrication shop Drawing and each certification be signed and dated by an official authorized by the company prior to beginning of fabrication:

Steel Fabricator Certification

The steel fabricator identified below certifies that for this project all load-bearing structural steel (as defined by the State of Ohio Department of Administrative Services, Directive Number 01-30, dated August 31, 2001) has been fabricated or produced, to the best of its knowledge, only from steel made in the United States in accordance with Sections 153.011 and 153.99, of the Ohio Revised Code (ORC). Further, the steel fabricator hereby certifies that it has read and understands that a monetary penalty for violations may be imposed under the authority of the referenced sections of the ORC.

[Printed or Typed Name of Fabrication Company]
by
[Printed or Typed Name of Company Official]

_____ _____
Signature of Company Official **Date**

Contractor Certification

The Contractor identified below certifies that it has required as condition of purchase, that for this project all load-bearing structural steel (as defined by the State of Ohio Department of Administrative Services, Directive Number 01-30, dated August 31, 2001) shall be fabricated and produced using, to the best of its knowledge, only steel made in the United States in accordance with Sections 153.011 and 153.99, of the Ohio Revised Code (ORC). Further, the Contractor certifies that it has read and understands that a monetary penalty for violations may be imposed under the authority of the referenced sections of the ORC.

[Printed or Typed Contractor Company Name]
by
[Printed or Typed Name and Title of Contractor Company Official]

_____ _____
Signature of Company Official **Date**

B. Certification of Experience: Submit, on request only, written summary of personnel, projects, and equipment which document the experience and qualifications required of the fabricator, inspection agency, erector, and welders.

C. Shop Drawings:
1. Indicate all shop and erection details, including cuts, copes, connections, holes, threaded fasteners, and welds. Include layout plan of all items to be embedded into concrete.
2. Indicate material specifications and finishes.
3. Indicate shop and field welds with symbols per AWS A2.4:2012.
4. Notwithstanding any other requirements specified elsewhere in these Specifications, one electronic copy of the shop Drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.

D. Proof of Compliance for Materials: Submit the following upon request only:
1. Mill reports for properly identified material for:
a. Structural steel shapes.
b. High strength threaded fasteners.

E. Inspection Reports: Submit reports for the inspection specified.

F. Submit erector's affidavit that frame has been erected plumb and level within the tolerances in the Code of Standard Practice.

1.04 PRODUCT DELIVERY AND STORAGE

A. Delivery:
1. Comply with A6/A6M-17a. Non-compliance will be cause for rejection.
2. Deliver anchor bolts and other items to be embedded in cast-in-place concrete or masonry prior to the start of that work. Provide setting drawings, templates, or instructions required for the installation of such items.

B. Storage:
1. Store steel at site above ground on platforms, skids or other supports.
2. Protect steel from damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. DOMESTIC STEEL USE REQUIREMENTS AS SPECIFIED IN SECTION 153.011 OF THE REVISED CODE APPLY TO THIS PROJECT. COPIES OF SECTION 153.011 CAN BE OBTAINED FROM ANY OF THE OFFICES OF THE DEPARTMENT OF ADMINISTRATIVE SERVICES.

B. Structural Steel Wide Flange Shapes:
1. Fy=50 ksi Steel: ASTM A572/A572M-18 or ASTM A992/A992M-11(2015).

C. Structural Steel Channels, Angles, Plates, Bars, Etc.:
   1. Fy=36 ksi Steel: ASTM A36/A36M-19.

D. Structural Steel Tubing:
   1. Fy=42 ksi Round Tubing: ASTM A501/A501M-14.
   2. Fy=46 ksi Square and Rectangular Tubing: ASTM A500/A500M-18, Grade B.

E. Structural Steel Pipe:
   1. Fy=35 ksi Pipe: ASTM A53/A53M-18, Grade B.

F. Anchor Bolts, Standard Bolts and Nuts: ASTM F1554-18. 36 KSI. Provide washers and heavy nuts for anchor bolts (both ends).

G. High Strength Threaded Fasteners:
   1. Bolts: ASTM A325-14, A325M-14, A490-14a or A490M-14a. All bolts are to be cold-forged with rolled threads.
   2. Nuts: ASTM A194/A194M-18, Type 2 or 2H, or ASTM A563-15 or A563M-07(2013), Type C, C3, D, DH, D3 or DH3. No other nuts are acceptable; nuts must show manufacturer's name and the 2H symbol.
   3. Washers: ASTM F436-18a or F436M-18a.

H. Welding Electrodes:
   1. For Carbon Steels: Conform to requirements of AWS D1.1/D1.1M:2015, using Series E70 electrodes, appropriate for the materials being welded.
   2. For Stainless Steel: Conform to requirements of AWS D1.6/D1.6M:2017 using Series E308 electrodes.
   3. For Stainless Steel to Carbon Steel Welding: Conform to the requirements of AWS D1.6/D1.6M:2007 using Series E309 electrodes.

I. Shop Paint Primer:
   1. For bare steel, use modified alkyd or alkyd-oil primers, equal in quality to V10-99 Tnemec Primer, or V10-99W Tnemec Primer, by Tnemec Company, Inc.
   2. For galvanized steel to be painted, use epoxy primer, equal in quality to Series 27 F.C. Typoxy by Tnemec Company, Inc.
   3. Primer to be compatible with finish paint.

J. Grating: All steel, 1 1/2 inches deep, with 3/16 inch bearing bars. May be welded, pressure-locked or riveted. The following are acceptable:
   1. Types GW by McNichols.
   2. Type W/B or B by Borden Metal Products Company
   3. Type WB by IKG.

   Attachment may be by tack welding or saddle clips.

K. Headed Studs: ASTM A108-18, Grades 1010 through 1020, inclusive, either semi-killed or killed deoxidization.

L. Masonry Anchors: 11 gauge channel slots or 3/16 inch diameter wires, shop welded to structural steel.

M. Deformed Bar Anchors: Flux-filled deformed bar anchors to be welded to structural steel. Material shall conform to ASTM A496/A496M-07; Acceptable products include Nelson D2L by Nelson Stud Welding/Stanley.

N. Stainless Steel: ASTM A666-15 – Type 304, 1/16 hard Fy = 45 ksi.

2.02 FABRICATION

A. Conform to applicable provisions of the reference standards listed in Part 1 of this Section, as modified herein.

B. Connection Design:
1. Select connections per AISC standards for forces and moments given on the Drawings. (In particular, note Schedule on Drawings for composite beams.) Where none are given, select connection for the full uniform load capacity of the member and for composite beams select connection for 1.5 x full uniform load capacity of the steel member.
2. Connections of beams framing into a girder from one side only, such as at spandrel girders, shall be made with double angle connections. Unless indicated otherwise, all other connections may be double angle connections or single plate shear connections.
3. Connections of HSS beams or girts to be end plates or double angles (oriented vertically) with bolts selected by the fabricator to develop the full uniform load capacity of the member for the member's strong axis or forces shown on plans. Connections of horizontal HSS members to HSS columns shall be field welded all around with AISC minimum fillet welds (or flare-bevel grove welds at HSS corners) with all welds grounded smooth per AESS requirements.
4. Connection details on the Drawings are to illustrate location, type, and general arrangement only, and to establish minimum requirements.
5. Shop connections may be welded or bolted, unless shown otherwise.
6. Field connections shall be bolted, unless shown otherwise.
7. Standard bolts and nuts are permitted only for connections of secondary members, unless noted otherwise. High strength threaded fasteners are required for all other bolted connections.

C. Camber: Provide beam camber as noted on the Drawings. If none is noted, orient beam so natural camber is upward.

D. Sweep: Fabricate exterior spandrel beams with natural sweep toward the interior of the building.

E. Finishing: Ends of members in direct contact bearing, such as columns at their bases and splices, are to be "finished," as defined in the Code of Standard Practice.

F. Bearing and Base Plates: Column base plates are to be shop attached. Beam bearing plates may be attached or loose.

G. Holes: Drill or punch holes in members as required for passage of conduit and piping, and attachment of joists, nailers, etc. Burning such holes is not permitted. If opening is not shown on structural Drawings, obtain prior approval.

H. Cleaning:
1. Remove oil, dirt, loose mill scale, or other material which would impair welding, performance of slip critical connections, or adherence of concrete or sprayed fireproofing.
2. For steel that is to be painted, cleaning techniques are to be as required by the appropriate SSPC paint Specification listed below.

I. Shop Painting:
1. Shop-paint steel exposed to view in the finished structure, except that to be galvanized, with primer as follows:
   a. Prepare surface by commercial blast cleaning (SSPC - SP6) and apply one (1) coat of primer.
   b. Minimum dry film thickness shall be 2.0 mils. The primer shall be applied in a manner to assure no runs or sags in the coating and an overall uniform application.
   c. Do not paint surfaces to be encased in concrete or to receive sprayed fireproofing, or contact surfaces in slip-critical connections, or surfaces to be field welded, or top surfaces of crane rails.
2. Steel not exposed to view in the finished structure need not be painted.
3. Paint all lintels in interior walls with one (1) coat of primer per the requirements in #1 above.
4. See the Architectural Drawings and Section 09 90 00 for galvanized steel items to be painted. Prepare the galvanized surface of galvanized steel that is to be painted by solvent cleaning (SSPC-SP1) or by high-pressure detergent cleaning to remove soluble contaminants. Use SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning to remove insoluble contaminants such as white rust, if present. Complete the cleaning process with SSPC-SP7 Brush Off Blast Cleaning, using the proper abrasive and care to prevent removal of the galvanizing. Prime paint with primer to be used for galvanized steel.

J. Galvanizing:
1. Galvanizing is to conform to ASTM A123/A123M-17, Grade 100, or ASTM A153/A153M-16a, Class C. Follow all recommendations of the American Galvanizers Association.
2. Except for bolts, nuts, washers, and anchors, perform all galvanizing after fabrication.
3. Prior to galvanizing, clean steel of foreign substances per ASTM A385/A385M-17.
4. Do not treat galvanized finish with a stain-inhibiting chromate treatment.
5. After final erection, touch-up all abrasions with a cold galvanizing compound, Z.R.C. Cold Galvanizing Compound or Z.R.C Galvilite Galvanizing Repair by Z.R.C Worldwide, or equal.
6. Galvanize all shelf angles, lintels in exterior walls, all exterior steel exposed to the elements, and all items indicated on the Drawings as "galvanized."

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section. This includes locations of anchor bolts, and lines and grades of bearing areas.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. Conform to the applicable provisions of the reference standards listed in Part 1 of this Section, as modified herein.

B. This structure is designed to be self-supporting and stable after the building is fully completed. It is solely the Contractor's responsibility to determine erection procedures and sequence, and to ensure the stability of the building and its component parts, and the adequacy of temporary or incomplete connections, during erection. This includes the addition of any shoring, sheeting, temporary guys, bracing or tie-downs that might be necessary. Such material is not shown on the Drawings. If applied, they shall be removed as conditions permit, and shall remain the Contractor's property.

C. Safety: It is solely the Contractor's responsibility to follow all applicable safety codes and regulations governing this work.

D. Clean bearing surfaces and other surfaces in permanent contact, prior to assembly.

E. Splices are permitted only where indicated.

F. Tolerances: Per AISC Code of Standard Practice. Note special requirements therein for "Architecturally Exposed Structural Steel."

G. Field corrections of fabrication errors by gas cutting is not permitted in structural members without prior approval of the Architect.

H. The use of leveling plates or leveling nuts at column bases is prohibited. Grout below column base plates is to be installed only after the steel is plumbed.

I. Welds which are subject to foot traffic or are exposed to view in the finished structure are to be ground smooth and flush with adjacent surfaces.

J. Touch-up Painting: After erection, touch-up field connections and abrasions in the shop coat with same paint used for shop coat. Do not paint welds until they have been cleaned in accordance with AWS D1.1/D1.1M:2015.

K. Remove galvanizing prior to welding. Touch-up with ZRC cold galvanizing compound by ZRC Products Company.

3.03 FIELD QUALITY CONTROL

A. Inspection agency shall perform the following:
   1. Review qualifications of welders, operators, and welding procedures submitted by the Contractor.
   2. Review materials' proofs of compliance. Identify markings of structural steel shapes to conform to ASTM standards specified. Review structural steel shapes certificates of compliance.

3. Inspect bolted connections, per the requirements of the AISC Specification for Structural Joints. Periodically identify markings of bolts to conform to ASTM standards specified. Periodically inspect bearing type bolts. Continuously inspect slip-critical connections. Review bolt manufacturer's certificates of compliance.
4. Inspect welded connections per the requirements of AWS D1.1/D1.1M:2015, Chapter 6. Identify markings of weld filler materials to conform to AWS specifications specified. Review weld filler materials certificates of compliance. Continuously inspect and test complete and partial penetration groove welds by other than visual methods. Continuously inspect and test multipass fillet welds using other than visual methods. Periodically inspect and test single pass fillet welds by visual methods.
5. Inspect installation of stud welding, per the requirements of AWS D1.1/D1.1M:2015, Articles 7.7 and 7.8.
6. Periodically inspect bracing and stiffening details of the steel frame for compliance with the construction documents.
7. Periodically inspect member locations of the steel frame.
8. Inspect the application of joint details at each connection for compliance with the construction documents.

B. Inspection agency shall be directly responsible to the Architect.

3.04 ADDITIONAL TESTING

A. The Owner reserves the right to perform non-destructive testing other than visual on any shop or field weld. The Owner shall be responsible for all associated costs including handling, surface preparation and non-destructive testing if welds are found to be acceptable, per AWS D1.1, Section 6, Part C. If the welds are not found to be acceptable the Contractor shall be responsible for the repair of discontinuities and all associated costs including those listed above.

END OF SECTION

SECTION 05 30 00
METAL DECKING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and materials required to furnish and install metal decking and accessories including shear connectors, closures, hanger devices, edge filler plates, pour stops, ridge and valley plates and end closure angles, where shown on the Drawings and/or required for a complete installation.

B. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

C. Related Sections: Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
1. Section 03 30 00, "Cast-In-Place Concrete"
2. Section 05 12 00, "Structural Steel"
3. Section 05 20 00, "Steel Joists"
4. Section _____, "Finish Painting"

D. Inspection Agency shall be the same agency retained under Section 05 12 00, "Structural Steel."

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 Edition, by the American Iron and Steel Institute.
2. SDI Roof Deck Design Manual (RDDM), May 2013, by the Steel Deck Institute.
3. Floor Deck Design Manual First Edition (FDDM), March 2014, by the Steel Deck Institute.
4. Diaphragm Design Manual, Third Edition (DDM04) September 2015, by the Steel Deck Institute.

B. Manufacturer's Qualifications: Regularly engaged in the manufacture of similar decking.

C. Erector's Qualifications: Minimum five (5) years' experience in installation of similar decking.

D. Welder's Qualifications: Personnel and procedures are to be qualified per the requirements of the American Welding Society, as given in AWS D1.3/D1.3M-2018.

1.03 SUBMITTALS

A. Certification of Experience: Submit, on request only, written summary of personnel, projects, and equipment which document the experience and qualifications required of the manufacturer, erector, and welders.

B. Shop Drawings:
1. Indicate mark, number, type, finish, and location of all deck units.
2. Indicate method of connection to supporting members. Provide literature from the fastener and/or deck manufacturers verifying compliance with the minimum required diaphragm shear strengths and stiffnesses.
3. Indicate details and installation instructions for all accessories.
4. Indicate sequence of installation, where critical.
5. Notwithstanding any other requirements specified elsewhere in these Specifications, one electronic copy of the shop drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.

C. Manufacturer's Certification:
1. Certify compliance with structural criteria. Published load tables and literature are usually acceptable. Provide design calculations on request only.
2. Certify compliance with finish criteria, with test reports as required.
3. Submit, on request only, mill test reports and certificates of compliance for shear connectors.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Prevent damage to deck or finish during handling and storage.

B. Store on blocking or platforms, off the ground, with one end elevated for drainage.

C. Protect from rusting with waterproof covering, or storage under roof.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

A. Composite Floor Deck:
1. Type: 3 inches deep, 20 gauge minimum.
2. Finish: Galvanized.
3. Structural Criteria:
a. Bare deck is to support wet load of concrete (including excess due to deflection of deck and beams) plus 20 psf. Coordinate with general contractor if motorize finishing equipment is to be used. If so, verify the required loading. Maximum deflection under expected load is not to exceed L/180. Increase gage of deck where this would be exceeded.

b. Composite slab is to support the live load shown on the Drawings, plus a superimposed dead load of 15 psf. Maximum deflection under this load is not to exceed L/360. Increase gage of deck where this would be exceeded.

4. Acceptable products include, but are not limited to:
   a. QL-99 by H.H. Robertson Company.
   b. 3 VLI by Vulcraft.
   c. 3 inch Composite Floor Deck by Cordeck Building Solutions.
   d. 3.0 CD by New Millennium.
5. Other: Number of headed stud shear connectors shown on the Drawings is based on the capacity available using deck with a 6 inch average rib width 12 inches on center. All manufacturers not meeting this criteria must adjust the number of studs as required to provide an equivalent capacity. All costs for additional studs, and their design, are to be borne by the Contractor.
6.

2.02 MATERIALS AND FINISHES

A. Materials: Steel sheet conforming to ASTM A653/A653M-19

B. Finishes:
   1. Galvanized: Conform to ASTM A653/A653M-19, G60.
   2. Painted: Clean units of scale and rust, phosphatize or bonderize, then apply coat of enamel, vinyl, or epoxy paint. Paint to meet the following criteria:
      a. Exposure to salt spray, per ASTM B117-18, for 72 hours. After exposure, there is to be no evidence of rusting, the degree of blistering is to be not worse than No. 8F per ASTM D714-02(2017), and undercutting at the scribe to be not worse than No. 10, per ASTM D1654-08(2016)e1.
      b. Water immersion, per ASTM D870-15, for 250 hours. After immersion, degree of blistering is to be not worse than No. 8 per ASTM D714-02(2017).
   3. Galvanized Plus Prime Painted: Baked on primer applied to underside of chemically cleaned and pre-treated galvanized deck.

C. Accessories: Same material and finish as deck units, except that interior closures may be of compressible material.

D. Hangers: Provide a system of hangers with composite floor deck, as follows:
   1. Hangers may consist of sidelap lip hangers, integral tabs, dovetail slots and hangers, slots and pigtail wires, or other devices.
   2. Allowable working load to be 60 lbs. per hanger, minimum.
   3. Maximum spacing is to be 24 inches in either direction.

E. Field Touch-Up Paint:
   1. For galvanized deck, use zinc chromate paint.

F. Shear Connectors: Headed studs conforming to ASTM A108-18, Grades 1010 through 1020, inclusive, either semi-killed or killed deoxidation.

G. Welding Electrodes: Conform to requirements of AWS D1.3/D1.3M-2018 using Series E60 electrodes, appropriate for the materials being welded, with welding washers as required.

H. Driven Fasteners: Manufactured from AISI 1061, 1062 or 1065 steel austempered to a minimum core hardness of 50-56 RC, and zinc-plated in accordance with ASTM B633-19 or ASTM B695-04(2016) to a minimum thickness of 0.0002 inches. Acceptable manufacturers include, but are not limited to:
   1. Hilti Fastening Systems
   2. ITW Buildex
   3. Pneutek, Inc.

I. Self-drilling Fasteners: Heat-treated and zinc-plated with fluted drill point. Acceptable products include, but are not limited to:
   1. Teks screws by ITW Buildex.
   2. Self-Drilling Screw Fasteners, by Hilti Fastening Systems.

2.03 FABRICATION

A. Units are to be continuous over at least three (3) spans, where possible. Where units are single or double span, use heavier gage if required for stress or deflection control. End laps (2 inches minimum) are to occur over supports. (End laps not required for composite floor deck.)

B. Units are to have nested side laps.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. Install decking in accordance with approved placing Drawings.

B. Tolerance: Align adjacent units within 1/4 inch in 40 feet.

C. Connection to Supporting Members: Connect to supports from top side only. Powder- and pneumatically-driven fasteners are not permitted unless approved by the Architect. Welds which burn holes in decking or supporting members will be rejected. Erector shall select the method of connecting the deck to the supports, including the connector type and spacing, and also the method of sidelap fastening, including the connector type and spacing, to provide the following minimum diaphragm shear strengths and stiffnesses, in accordance with the SDI Diaphragm Design Manual:

Deck Type	Shear Strength (plf)	Stiffness (k/in)
Composite floor deck (including concrete fill)	1600	2400

Submit for approval the proposed method of connecting the deck and information verifying compliance with the above requirements. Additional minimum requirements for connections are as follows:

1. Roof Deck: Attach to resist a gross uplift of 45 lbs. per square foot in eave overhang areas, 30 lbs. per square foot in all other areas. Connections shall occur at all ribs for 3 inch roof deck (8 inch spacing) (24/4). Connections shall occur at every other rib for 1 1/2 inch roof deck (12 inch spacing) (36/4), except all side laps shall be connected to supports.
2. Composite Floor Deck: Connections may include thru-welded shear connectors. Connections shall occur at all ribs (12 inch spacing) (36/4).
3. Metal Centering: Use the manufacturer's standard welding washers for welded connections. Connections shall occur at 10 inch spacing (30/4).
4. Miscellaneous: Connection spacing shall be the same for all supports (both interior and end lap supports).

D. Shear Connectors:
1. Space studs equally along beam length, to the extent possible (unless other distribution is noted on the Drawings).
2. Where number of studs on a beam exceeds the number of available ribs in the deck, the ribs with multiple studs are to be those nearest the ends of the beam.
3. Where a rib contains one stud, locate the stud directly over the beam web; where it contains more than one stud, arrange them symmetrically about the beam web. Maintain minimum center-to-center spacing of 4 1/2 inches along length of beam, and 3 inches transverse to beam.

E. Sidelap Fastening: Spacing shall not exceed 3 feet. Button punching is acceptable at composite deck.

F. Closures: Install in deck flutes over supports or other construction at building perimeter and at perimeters of interior rooms. Set in a true even line, flush with construction below, eliminating any shelf or pocket. Closures are to be accurately shaped and installed, to provide a tight fit.

G. Openings: Field cut small openings, bevels, miters, etc., as required. Provide reinforcing for openings which interrupt ribs.

H. Hanging Loads: Do not hang items from the underside of metal roof decks or metal centering, unless specifically approved by the Architect. Hang items from concrete floors formed with composite floor deck no sooner than seven (7) days after concrete is placed.

I. Construction Loads: Do not use deck as storage or working platform until it has been permanently attached to supports. Assure that construction loads do not exceed the carrying capacity of the deck.

J. Repair and Touch-Up:
   1. Where deck will be exposed to view, remove and replace any units with damage or defects which cannot be concealed by painting.
   2. Where deck will not be exposed to view, repair any cuts and holes with plate of same gage as deck.
   3. Touch up all damaged areas of finish, on both top and bottom sides of deck.

3.03 FIELD QUALITY CONTROL

A. Inspection shall include visual examination of deck and its attachment to the supporting structure, including quantity of connectors and/or fusion welds and the quality of the connections to the supporting structure.

B. Inspect installation of welded stud shear connectors for composite beams per the requirements of AWS D1.1/D1.1M:2015, Articles 7.7 and 7.8.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes materials and services to fabricate and install miscellaneous metals indicated or required to complete the work and not specified in other Sections.

B. This Section includes, but is not limited to, the following:

1. Attic access ladder
2. Loose steel lintels.
3. Steel bollards
4. Steel framing and supports for overhead doors, ceiling hung toilet compartments, countertops, mechanical and electrical equipment.

C. Related Sections:

1. Section 03 30 00 – Cast-In-Place Concrete for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete
2. Section 05 12 00 – Structural Steel for structural-steel framing system components.
3. Section 09 96 00 – High Performance Coatings: Field-applied painted finish.

1.02 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For the following:

1. Paint products
2. Grout

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.04 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.07 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

C. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

PART 2 – PRODUCTS

2.01 GENERAL

A. Material shall be free from defects impairing strength, durability or appearance, of best commercial quality for purposes specified. It shall have structural properties to safely withstand strains and stresses to which normally subjected.

B. Fastenings shall insofar as practical, be non-corrosive, non-staining and concealed. Fastenings that must be exposed shall be of same materials, color and finish as material to which applied, shall be countersunk and finished flush.

C. Exposed welds shall be ground smooth to form a neat uniform fillet without weakening base metal. Unexposed welds shall have all slag removed before applying shop coating. Molded, bent or shaped members shall be formed with clean, sharp arises, without dents, scratches, cracks or other defects. Provide all anchors, bolts, shims and accessory items required for building into or fastening to adjacent work.

2.02 FERROUS METALS

A. Steel Plates, Shapes, and Bars; ASTM A36.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A500.

C. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads or drawings.

D. Malleable-Iron Castings: ASTM A47, Grade 32510 (ASTM A47M, Grade 22010).

E. Gray-Iron Castings: ASTM A48, Class 30 (ASTM A48M, Class 200), unless another weight is indicated or required by structural loads or drawings.

F. Cast-In-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a minimum safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153/A.

G. Welding Rods and Bare Electrodes: Select according to AW S specifications for metal alloy welded.

2.03 METAL COATINGS

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified- alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing: Zinc coating in accordance with ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1. Structural shapes and plates: 1/4 inch thickness: Grade 85; 1/4 inch thickness: Grade 100.

C. Galvanizing Repair Paint: High-zinc-dust-content for re-galvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D1187.

2.04 FASTENERS

A. All fasteners in exterior assemblies or exterior walls to be stainless steel.

B. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

C. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring iron fabrications to other types of construction indicated and capable of withstanding design loads.

D. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

E. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

F. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

G. Plain Washers: Round, carbon steel, ASME B18.22.1.

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

I. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

J. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.05 MISCELLANEOUS ITEMS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 painting Sections.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

D. Intermediate Coats and Topcoats: Provide products that comply with Division 09 painting sections.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

A. Fabricate work in shops, to greatest extent possible, with adequate machinery to produce the items as described herein. Employ qualified metal workers.

B. Assemble each item in the shop checking field dimensions and establishing proper tolerances for joints. Disassemble work only to the extent required for shipping and reassembling in the field. Measurements shall be accurate, cutting true to line, joints tight and secure.

C. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support, Use type of materials shown or specified for various components of work.

D. When cutting torch is used, the burned edges of the metal shall be milled to dimension.

E. Holes shall be drilled or punched, not cut with the torch. Punching or drilling shall be accurately done and any holes not matching shall be reamed and not drifted.

F. Welding shall be done with electric arc equipment and executed in accordance with the "Code for Fusion Welding in Building Construction" of the American Welding Society. The welding electrode shall conform to American Welding Society Specification Class #40. Welding joints in metal cut with torch shall have the scale and burned metal ground or chipped back to bright metal before welding. Welded joints that will be exposed to view shall have the welds so formed that the joint can and shall be ground smooth with the connected surfaces.

G. Joining of metal members shall be designed to develop the full strength of the members at the connection. W here members are bolted together not less than two (2) bolts are to be used for each connection, unless otherwise noted.

H. Ease exposed edges to radius of approximately 1/32 inch (1 mm), unless otherwise indicated.

I. Remove sharp or rough areas on exposed traffic surfaces.

J. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

K. Allow for thermal movement resulting from 120 deg F (67 deg C) ambient and 180 deg F (100 deg C) surface change in temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

L. Shop Painting: Shop prime all metals, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces. Touch-up all welds in ferrous metals with galvanizing repair paint.

M. Galvanize Coating: Provide the specified galvanize coating to metals indicated on the drawings and the following locations:

1. Exterior door and window lintels.

2.07 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".
2. Interiors (SSPC Zone 1A): SSPC-SP3, "Power Tool Cleaning".

C. All ferrous metals in exterior assemblies or exterior walls to be hot dipped galvanized after fabrication.

D. Galvanizing: Hot-dip galvanize items exposed to weather, high moisture, corrosive conditions, and as indicated to comply with applicable standard listed below:

1. ASTM A 123, two ounces per square foot, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

E. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1", for shop painting.

1. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.
2. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection and on all lintels and other members built into exterior masonry walls. Change color of second coat to distinguish it from the first.
3. Metal fabrications that are indicated to be field painted shall be primed painted again with the coating systems specified in Section 09 91 00, and finished painted with specified coating system.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, supporting structure and installation conditions. Do not proceed with metal fabrication installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility of satisfactory performance.

3.02 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates and instructions for installation of anchorages which are required to be cast into concrete or embedded in masonry construction.

3.03 INSTALLATION

A. Provide anchorage devices and fasteners necessary for securing metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

1. Conceal fasteners whenever possible.
2. Secure metal to wood with lag screws of adequate size, with appropriate washers.
3. Secure metal to concrete with embedded anchors, sleeves, setting components or setting grout.
4. Use expansion bolts, toggle bolts or screws for light duty service only.
5. Provide all fabricated items complete with attachment devices required for installation.

B. Perform cutting, drilling and fitting required for installation of metal fabrications. Set work accurately in location, alignment and elevation, plumb, level true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

C. Fit exposed connections accurately together to form hairline joints. Weld connections which are not to be left as exposed joints. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dipped galvanized after fabrication and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made and methods used in correcting welding work.

3.04 ATTIC ACCESS LADDER

A. General: Comply with ANSI A14.3, unless otherwise indicated.

B. Steel Ladders:

1. Space siderails 18 inches apart, unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 1-inch- diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

3.05 LOOSE STEEL LINTELS

A. General Contractor shall furnish lintels for all openings through walls when openings are shown on the architectural or structural (General Contract) drawings. Note all such lintels and openings to require coordination of work and exact locations, by affected contractors. All such plumbing, HVAC, electrical, and sprinkler openings must be coordinated and shown on the Architectural and/or Structural Drawings.

B. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in walls and partitions at locations indicated.

C. Lintels sized as scheduled in “Structural Notes” on structural drawings.

3.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work.

B. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Provide interior miscellaneous framing and supports shop primed, exterior items galvanized. Painting as scheduled in Section 09 96 00 – High Performance Coatings.

D. Miscellaneous items cast-in concrete; galvanized finish.

END OF SECTION

SECTION 06 05 00

RECLAIMED TIMBER BEAMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Reclaimed timber for reuse as structural wood beams in new construction.
2. Related accessories, and fastenings.

B. Related Sections:

1. Section 02 42 13 – Deconstruction of Structure
2. Section 06 10 00 – Rough Carpentry

C. Allowances: Refer to Section 01 23 00 – Allowances for work of this section affected by allowances.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Salvaged Lumber: Provide documentation certifying products are from salvaged lumber sources
2. Recovered Lumber: Provide documentation certifying products are from recovered lumber sources.
3. Indicate materials, sizes, profiles, surface textures.

C. Submit Samples:

1. Each type of siding furnished under this section. Samples shall be accurate representations of materials which will be installed in the Work and shall be large enough to show characteristics of the materials which will be visible in the finished work.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 60 00.

B. Do not deliver wood products until after concrete, masonry, plaster, ceramic tile and similar wet work is completely cured and dried.

C. Inspect materials upon delivery to assure that specified products have been received. Keep damaged material identified as damaged and removed from the site.

D. Store materials in a safe area, away from construction traffic; store under cover and off ground, protected from moisture.

1. Store off the ground, under cover in a weather-tight location, and well ventilated. Protect from dirt, dampness, and damage
2. Store to avoid twisting, bending, abrasion and other permanent damage.

E. Avoid contact with materials causing discoloration, staining or other damage.

1.04 QUALITY ASSURANCE

A. Where reclaimed lumber materials are used for structural applications, include lumber certification and quality grading.

1.05 PROJECT CONDITIONS

A. Wood materials shall be allowed to acclimate to the site prior to work under this section. Wood materials shall be stored, stickered, and under cover at the site for a minimum of seven to ten days prior to finishing and installation.

B. Maintain an ambient temperature between 65 and 75 degrees Fahrenheit in spaces to receive wood products for at least seven days before installation, during installation, and for at least seven days after installation. After post-installation period, maintain relative humidity and ambient temperature planned for building occupants.

C. Do not install wood products until it has adjusted to the relative humidity and temperature of the space where it is to be installed.

PART 2 – PRODUCTS

2.01 RECLAIMED WOOD BEAMS

A. Lumber Sourcing:

1. Salvaged Lumber: Lumber from deconstruction or demolition of existing buildings or structures. Salvaged lumber shall be delivered clean, washed, denailed, and free of paint and finish materials, and other contamination.
2. Recovered Lumber: Previously harvested lumber pulled from riverbeds or otherwise abandoned. Recovered lumber shall be delivered clean and free of contamination.

B. Species: Source reclaimed timber from reclaim source with species to match existing barn lumber. Verify that existing lumber is Beech.

C. Source: Lumber which is naturally weathered to achieve a rustic grayish/brown appearance. Acceptable materials may be the following:

1. Lumber reclaimed from various salvage projects,
2. Lumber cut from beetle-killed, fire-killed or dead-standing trees or other "rescued" sources,
3. Lumber cut from material which has weathered out of spec, and
4. New lumber.
5. Appearance Variation: Weathered (degree of weathering varies)
6. Moisture content/stability: Air dried
7. Weight: Depending on species mix. Typically , approximately 2.5 pounds per board foot.

D. Knots: Unlimited sound tight knots allowed, with some surface unevenness from chipped or open knots.

E. Texture: Face of material will have varying textures from weathered rough sawn to heavy weathering on rough sawn. All products can be ripped edged, milled for installation purpose and will show "bright wood on those milled.

F. Holes: Knots, nails and bolt holes may be present as well as open knots.

G. Discoloration: Ferrous staining may be present in nail and bolt holes. Color and patina will vary.

H. Checks: Checks allowed as long as lumber will install for purpose intended.

I. Required Dimensions: Refer to Structural drawings.

1. Select lumber sizes to minimize waste.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully examine the installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

A. Furnish reclaimed wood suitable for the intended application. Provide materials as follows:

1. Paint removed
2. Metals removed
3. Fumigation
4. Light surface washing, clean and dried
5. Kiln-drying

B. Approved materials will be based on samples submitted for approval.

3.03 INSTALLATION

A. Section 06 10 00 – Rough Carpentry.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes rough carpentry work including the following:

1. Framing with dimension lumber and engineered wood products.
2. Wall and roof sheathing and subfloor sheathing.
3. Concealed blocking for use in for support of accessories, countertops, equipment, fixtures, specialty items, trim and facing materials.
4. Backing panels.

B. Sill sealer insulating strip: Air seal break

C. Rough installation hardware, including bolts, screws, spikes, nails, clips, and connection assemblies, as needed for installation of the rough carpentry work.

D. Related Sections:

1. Refer to Structural General Notes on Drawings
2. Section 06 17 53 – Pre-Engineered Wood Trusses

1.02 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. APA – The Engineered Wood Association:

   a. APA Design/Construction Guide: "Residential and Commercial," Form No. E30V (2011).
   b. APA PRP-108 – “Performance Standards and Policies for Structural-Use Panels.”

2. AWPA – American Wood Protection Association:

   a. AWPA M4 – “Standard for the Care of Preservative Treated Wood Products.”
   b. AWPA U1-16 – Use Category System: User Specification for Treated Wood.

3. NELMA: Northeastern Lumber Manufacturers Association

   a. Standard Grading Rules for Northeastern Lumber.

4. NLGA – National Lumber Grades Authority.
5. SPIB – Southern Pine Inspection Bureau.

   a. Standard Grading Rules for Southern Pine Lumber.

6. U.S. Department of Commerce, National Institute of Standards and Technology; Product Standards (PS): Softwood Lumber and Plywood Standards:

   a. DOC PS1 – "Construction and Industrial Plywood."
   b. DOC PS2 – "Performance Standard for Wood-based Structural Use Panels."
   c. DOC PS20 – "American Softwood Lumber Standard."

7. WWPA – Western Wood Products Association.

   a. Western Lumber Grading Rules.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures for submittal requirements.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.

1.04 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Lumber shall conform to U.S. Product Standard PS20, "American Lumber Standards for Softwood Lumber."

1. Lumber grades shall conform to grading rules of association under which lumber is produced and shall bear official grade and trademark of the inspection bureau of the association.

C. Construction Panel Standards: PS 1, U.S. Product Standard for Construction and Industrial Plywood; APA PRP-108.

D. Preservative Treatment: AWPA Standard U1; waterborne pressure treatment. Provide for wood in contact with soil, concrete, masonry, roofing, flashing, dampproofing and waterproofing or where indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber and plywood well off the ground to ensure proper ventilation and drainage. Cover top and sides and protect from the elements, dampness, high humidity, damage and breakage. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

B. Store, handle, and protect treated lumber and plywood materials in accordance with AWPA M4 "Care of Pressure-Treated Wood Products."

1.06 COORDINATION

A. Fit rough carpentry to other work. Scribe and cope for accurate fit. Coordinate location of furring, nailers, blocking, grounds, and similar supports to allow proper attachment of other work.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.

D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.
3. Provide lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood).

B. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

C. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

D. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb/cu. ft.

E. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.03 DIMENSION LUMBER AND ENGINEERED WOOD FRAMING

A. Refer to Structural General Notes, “Structural Lumber”

2.04 MISCELLANEOUS LUMBER

A. General: Provide lumber of grade indicated according to ALSC National Grading Rule (NGR) provisions, for support or attachment of the construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

1. Grade: No. 2.
2. Species:

    a. Spruce-pine-fir south; NELMA.
    b. Southern pine; SPIB.
    c. Douglas-fir-larch: WCLIB or WWPA.
    d. Hem-fir: WCLIB or WWPA.

3. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shaped shown.
4. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

2.05 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

A. Refer to Structural Drawings for Information.

B. Provide either all-veneer, mat-formed, or composite panels complying with DOC PS2, “Performance Standard for Wood-Based Structural-Use Panels,” unless otherwise indicated. Provide plywood panels complying with DOC PS 1, “U.S. Product Standard for Construction and Industrial Plywood,” where plywood is indicated.

C. Factory mark structural use panels with APA trademark evidencing compliance with grade requirements.

2.06 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail.

1. Thickness Provide panels meeting requirements specified but not less than the thickness indicated.
2. Span Ratings: Provide panels with span ratings required to meet “Code Plus” provisions of APA Design/Construction Guide: "Residential and Commercial," Form No. E30.

B. Construction Panels:

1. Plywood: DOC PS 1, unless otherwise indicated.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Factory mark panels according to indicated standard.

C. Structural Use Panels for Underlayment:

1. Over smooth subfloors, provide underlayment not less than 1/4 inch thick. Over board or uneven floors, provide underlayment not less than 11/32 inch thick.
2. Plywood Underlayment for Wood Flooring: For underlayment under 19/32 inch thick, provide plywood panels with fully sanded face and as follows:

    a. Grade: APA C-C Plugged Exterior.

D. Structural Use Panels for Backing: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacturer.

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc-coating per ASTM A153 or of Type 304 stainless steel.
2. Where carpentry is exposed to pressure-preservative treated wood, provide fasteners of Type 304 or 316 stainless steel.
3. Nails, Brads, and Staples: ASTM F 1667.
4. Power-Driven Fasteners: NES NER-272.
5. Wood Screws: ASME B18.6.1.
6. Lag Bolts: ASME B18.2.1.
7. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

B. Screws for Fastening to Non-Structural Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

C. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing in accordance with ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.08 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:

1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

C. Joist Hangers: U-shaped joist hangers with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.

1. Thickness: As indicated on the Structural Drawings.

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: As indicated on the Structural Drawings.
2. Thickness: As indicated on the Structural Drawings.
3. Designed for connection of engineered wood products, sized to support design loads.

E. Bridging: Rigid, V-section, nailless type, 0.064 inch thick, length to suit joist size and spacing.

F. Post Bases: As indicated on Structural Drawings

G. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

1. Width: As indicated on the Structural Drawings.
2. Thickness: As indicated on the Structural Drawings.
3. Length: As indicated on the Structural Drawings.

H. Rafter Tie-Downs (Hurricane Ties): As indicated on the Structural Drawings.

I. Floor-to-Floor Ties: Flat straps as indicated on the Structural Drawings.

2.09 AIR SEALING

A. Sill-Sealer Gaskets: Closed cell foam resilient insulation, fabricated in strip form, for use as a sill sealer; applied between concrete and mud sill; 3/16-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

1. Acceptable Manufacturers:

a. Owens Corning: ProPink Comforseal Framing Gasket
b. Dupont: Styrofoam Brand Sill Seal
c. Kingspan GreenGuard Sill Sealer

B. Air Seal Sealant:

1. Manufacturer:

a. Tremco Acoustical Sealant
b. Sashco Lexel Sealant
c. Contega HF

2. Application: Continuous between concrete and mud seal and top of sill seal and mud seal.

C. Air Seal Tapes: (In lieu of sealant)

1. Manufacturers:

a. Siga: Fentrum or Wigluv

b. Delta Multi-Band tape

2. Application: Continuous between exterior concrete and mud seal.

PART 3 – EXECUTION

3.01 INSTALLATION, GENERAL

A. Carefully lay out, fit, and fabricate all items of rough carpentry. Use only treated, sound thoroughly seasoned materials of longest practical lengths and sizes to minimize joints. Use materials free of warp, unless warp can be easily corrected by anchorage and attachment. Brace, plumb, and level all members, and secure with sufficient nails, spikes, bolts, or other suitable fastenings to assure rigidity and permanent attachment.

1. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
2. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. “Table 2304.10.1 – Fastening Schedule” of the Ohio Building Code.

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated. Install fasteners without splitting wood; predrill as required.

E. Use hot-dip galvanized or stainless steel nails where rough carpentry is exposed to weather, on ground contact, or in area of high relative humidity.

F. Apply field treatment complying with AWPA M4 to cut surfaces of preservative treated lumber and plywood.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous self-adhered polymer modified separator between wood and metal decking.

3.02 WOOD NAILERS AND BLOCKING

A. Install wood grounds, nailers, blocking and sleepers where shown and where required for screeding or attaching other work. Install in accurate locations and elevations for attachment of other materials, plumb and level, accurately aligned, cut and fit. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and buts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement. Provide wood blocking between studs at height of door stop, behind stop, at door openings in stud framing.

C. Install permanent grounds of dressed, preservative-treated, key beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds where no longer required.

D. Provide wood bucks around window and mechanical openings as required, sized so flanges will cover buck.

1. Anchor to walls and partitions with 3/8 inch bolts.
2. Verify flange dimensions with concerned trades.

E. Install appropriate concealed blocking, headers, and supports, to receive fixtures, accessories and similar items mounted on gypsum board partitions as may be required.

F. Provide concealed blocking and framing to support facing accessories, countertops, equipment, fixtures, specialty items, trim and facing materials.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

3.03 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

1. Firestop furred spaces of walls at each floor level and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal-size furring at 24 inches o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring at 16 inches o.c., vertically.

3.04 SILL PLATE INSULATING STRIP

A. Installation of Sill Plate Insulating Strip:

1. Sweep any debris from foundation surface. Unroll sill sealer across the top of the foundation wall, making sure it is flush with the face of the wall.
2. Butt end and perpendicular joints tightly; do not overlap.
3. Impale sill sealer to fit over anchor bolts.
4. Set sill plate on the top of the foundation wall and anchor securely.

3.05 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Install framing members of size and at spacing indicated.

3.06 WALL AND PARTITION FRAMING

A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.

B. Construct corners and intersections with 3 or more studs. Provide miscellaneous blocking and framing as shown and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide continuous horizontal blocking at mid-height of single-story partitions and multistory partitions, using members of 2-inch nominal thickness and of same width as wall or partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
2. For load-bearing walls, provide headers and jambs as indicated.

3.07 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.08 INSTALLATION OF STRUCTURAL-USE PANELS

A. Comply with applicable recommendations contained in APA Form No. E30, “APA Design/Construction Guide: Residential & Commercial,” for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subflooring-Underlayment: Glue and nail to framing throughout.
2. Subflooring: Glue and nail to framing throughout.
    a. Space panels 1/8 inch at edges and ends.
3. Sheathing:
    a. Nail to wood framing.
    b. Space panels 1/8 inch at edges and ends.
4. Underlayment: Nail to subflooring.
    a. Space panels 1/32 inch at edges and ends.
    b. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
5. Plywood Backing Panels: Nail or screw to supports.
    a. Provide panel mounting backboards for HVAC, Fire Prevention, Electrical and telephone/data equipment. Fabricate panels using fire-retardant treated 3/4 inch thick panels mounted to fire-retardant treated 2 by 4’s. Provide a nominal space of 3-1/2 inches behind panels to permit wiring.
6. Lay-out panels with face grain oriented perpendicular to the supporting members.
7. Install roof sheathing with panel clips at all edges.

END OF SECTION

SECTION 06 11 00
STRUCTURAL LUMBER AND SHEATHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and materials for structural lumber shown on the Drawings for walls, roof and floor framing, and sheathing, including all connections and accessory materials shown on the Drawings, required by this Section, or necessary for a complete installation.

B. Related Sections: Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
1. Section 03 30 00, "Cast-In-Place Concrete"
2. Division 04, Masonry
3. Section 05 12 00, "Structural Steel"
4. Section 05 30 00, "Metal Decking"
5. Section 06 17 53, "Prefabricated Wood Trusses"

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. National Design Specification for Wood Construction, by the American Wood Council, 2015 Edition.
2. Panel Design Specification, May 2012 by APA – Engineered Wood Association.
3. Voluntary Product Standard PS1-09.
4. Voluntary Product Standard PS2-10.
5. APA PRP-108 – Performance Standards and Policies for Structural-Use Panels, May 2002, by APA – The Engineered Wood Association.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber: Spruce Pine Fir No. 1/No. 2 or better, surfaced at 19% moisture content. Minimum allowable design stresses per the National Design Specification Supplement.

B. Plywood Sheathing manufactured to conform to Voluntary Product Standard PS1-09:
1. For roofs and walls: C-D plugged, Structural I, exposure 1, 5 ply, with panel index of 24/0; 1/2 inch thick (with plywood clips for roof sheathing).
2. For floors: C-D plugged, Sturd-I-Floor, exposure 1, 5 ply, with panel index of 24 OC; 3/4 inch thick, tongue and groove.

C. Oriented Strand Board (OSB) manufactured to conform to Voluntary Product Standard PS2-10 and APA PRP-108:
1. For walls: 1/2 inch thick with panel index of 24/0, exposure 1.
2. For roofs: 1/2 inch thick with panel index of 24/0 exposure 1.
3. For floors: 3/4 inch thick with panel index of 24” O.C., exposure 1, tongue and groove.

D. Nails: Unless noted otherwise, all nails and spikes are to be common wire (when connecting to wood treated with ACQ use galvanized nails conforming to ASTM A153/A153M-16a or stainless steel).

E. Bolts: Conform to ASTM A307-14e.

F. Framing Anchors: Use the products of The Simpson Company or equivalent products of other approved manufacturer.

G. Plywood Clips: PSCL/PSCA by the Simpson Company or equivalent products of other approved manufacturers.

H. Adhesive: Conform to ASTM D3498-19a.

I. Treated Lumber: Alkaline Copper Quaternary (ACQ), Preserve ACQ by Viance Treated Wood Solutions. Retention rate as follows:
   1. Decks, exterior exposure – 0.25 to 0.40 pcf.
   2. Ground contact – 0.40 pcf.
   3. Permanent wood foundations – 0.60 pcf.
   4. Decking with water repellent – 0.15 pcf.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. In stud walls, attach sill plates to supporting structure with the equivalent of a 1/2 inch bolt at 48 inches on center.

B. Provide solid blocking at mid-height of stud walls.

C. Provide solid or diagonal bridging at midspan of all joists and rafters.

D. Attach all sheathing to supporting members per the requirements of the APA.

E. Apply adhesive per manufacturer's written recommendations.

F. Provide and install bridging for prefabricated wood trusses as indicated on the truss manufacturer's approved Shop Drawings.

3.03 ACCEPTANCE

A. Members with excessive knots, twists, checks, or shakes, or other obvious imperfections, will be rejected.

END OF SECTION

SECTION 06 12 00

STRUCTURAL INSULATED PANELS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes structural insulated panels (SIPs).

B. Related Sections include the following:

1. Section 06 10 00 – Rough Carpentry

1.02 REFERENCES

A. ACSE 7 – Minimum Loads for Building and other Structures.

B. NTA IM14 – Structural Insulated Panels, SEP 01, TIP 01

C. ASTM International:

1. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
2. ASTM D7446 - Standard Specification for Structural Insulated Panel (SIP) Adhesives for Laminating Oriented Strand Board (OSB) to Rigid Cellular Polystyrene Thermal Insulation Core Materials
3. ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
4. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
5. ASTM E1803 – Standard Test Method for Determining Structural Capacities of Insulated Panels

D. APA The Engineered Wood Association Publications:

1. DOC PS2 – Performance Standard for Wood-Based Structural-Use Panels.
2. APA PRP-108 – Performance Standards and Qualification Policy for Structural-Use Panels

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide SIPs capable of withstanding design loads including dead load, live loads, wind loads and seismic loads. Design loads shall be in compliance with the requirements of the local Building Code.

B. Provide SIPs which have been manufactured, fabricated and installed to withstand loads and maintain performance criteria stated by SIP manufacturers without defects, damage or failure.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: SIP manufacturer’s product literature including structural properties and installation instructions.

C. Shop Drawings: Submit shop drawings for SIPs showing layout, elevations, SIP details, product components and accessories. SIP installation drawing shall be reviewed by and sealed by a registered professional engineer qualified to perform such work. Deviations from standard detail and load design values shall be calculated and signed and sealed by a registered Professional Engineer.

D. Samples: Submit 12 inch by 12 inch (305 mm by 305 mm) sample panel.

E. SIP Code Compliance Report: Submit manufacturer's ICC-ES evaluation report for the International Building Code.

1.05 QUALITY ASSURANCE

A. SIP Manufacturer shall be a member of the Structural Insulated Panel Association (SIPA).

B. Structural Design: A professional engineer shall perform a structural analysis and design of the SIP assemblies in accordance with the design loads.

C. Installation Contractor must have experience on projects of similar size and scope. Lead installer / supervisor shall have a minimum of 3 years' experience installing SIPs or have completed a certifying curriculum at a dedicated SIP training program.

D. Field Measurements: Provide field measurements of structure to SIPs manufacturer prior to fabrication of panels. Coordinate fabrication schedule to comply with project schedule requirements.

E. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, foundation/structural system/substrate conditions, review SIP manufacturer installation instructions and requirements for SIP manufacturer warranty. Comply with Division 01 section Project Coordination.

F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Erect panels in area designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Correct mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with SIP manufacturer's ordering instructions and lead time requirement to avoid construction delays.

B. Delivery: Deliver material from SIP manufacturer with identification label or markings intact.

C. Off-load SIPs from truck and handle using fork lift or other means to prevent damage to SIPs.

D. SIPs shall be fully supported in storage and prevented from contact with the ground. Stack SIPs on pallet or a minimum of three stickers for every 8 feet of SIP length.

E. SIPs shall be fully protected from weather. Protect against exposure to rain, water, dirt, mud and other residue that may affect SIP performance. Cover stored SIPs with protective wraps. SIPs shall be stored in a protected area.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer to the greatest extent practical. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 COORDINATION

A. Time delivery and installation of SIPs to avoid extended on-site storage and to avoid delaying progress.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for the project warranty provisions.

B. Manufacturer's Warranty: Submit SIP manufacturer's standard warranty document, SIP Manufacturer's warranty is in addition to and not a limitation of other right Owner may have under Contract Documents. Warranty Period: One year commencing on Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers/Fabricators and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers/fabricators offering products that may be incorporated into the Work include but are not limited to those listed.

1. Murus Company (The), Mansfield, PA.
2. Acme Panel Co,. Columbus, OH
3. Lamit by Armstrong, Newark, OH

4. Insulspan, Blissfield, MI
5. Urban Industries of Ohio, Gallion, OH

2.02 STRUCTURAL INSULATED PANELS (SIP)

A. Oriented Strand Board (OSB): OSB: APA performance rating mark shall be identified on the panel, with an Exposure 1 durability rating; minimum physical properties shall be tested and described in APA PRP-108 or NIST PS 2. 7/16 inch (11 mm) thickness unless noted otherwise.

1. Cam Locks: If indicated or required, shall be installed in the panel during the manufacturing process.
2. Wiring Chases: If indicated or required, shall be formed into the panel during the manufacturing process.

B. Expanded Polystyrene Core: Minimum of .95 pcf (15 kg/cu m) insulation meeting manufacturer's quality standards and the following. Insulation manufacturer shall provide confirmation of Third Party Certification:

1. K Factor: .26, ASTM C 518.
2. Compressive Strength: 10 psi, ASTM D 1621.
3. Flexural Strength: 25 psi min, ASTM C 203.
4. Tensile Strength: 28 psi min, ASTM C 297.
5. Shear Strength: 16 psi min, ASTM C 273.
6. Shear Modulus: 440 psi min, ASTM C 273.
7. Modulus of Elasticity: 915 psi min, ASTM C 203.
8. WVT/Perm Inches: 5.0 max, ASTM E 96.
9. Water Absorption (by volume): 4% max, ASTM C 272.
10. Maximum Service Temperature: 165 degrees F.
11. Foam Fire Rating: Class 1, ASTM E 84.
12. Flame Spread: <25, ASTM E 84.
13. Smoke Developed: <450, ASTM E 84.
14. Transverse Load: ASTM E 72.
15. Combined Axial and Bending: ASTM E 72

2.03 LUMBER

A. Grade and Species: Visually graded dimension lumber No. 2 or better of any of the following species:

1. Spruce-Pine-Fir; NLGA
2. Hem-Fir (North); WCLIB or WWPA
3. Douglas Fir – Larch; WCLIB or WWPA
4. Southern Pine; SPIB

B. Lumber shall be kiln dried to not more than 19% moisture content

C. Lumber shall be clearly marked with grade stamp of grading agency.

D. Engineered wood products shall be used where required for structural adequacy.

1. Laminated Veneer Lumber (LVL)
2. Parallel Strand Lumber (LSL)
3. Laminated Strand Lumber (LSL)

2.04 MATERIALS

A. Materials:

1. SIPs consisting of the following:

a. UL certified EPS core with termite resistant treatment, minimum of 0.95 pfc (15.2kg/m3) complying with ASTM C578 Type I and having ICC ES recognition of termite resistance. Insulation manufacturer shall provide Third Party UL certificate. ICC ES report shall be provided for recognition of termite resistance in compliance with ICC EG239. Minimum shear strength of the EPS core is to be 18 psi.
b. OSB identified with APA or PFS performance mark with Exposure I durability rating and performance in accordance with DOC PS-2 span rating 24/16 or greater, and APA PR-N610 and APA PR-N612 or APA PR-N614.

c. Adhesives shall be in conformance with ICC ES AC05 – Acceptance for Sandwich Panel Adhesive.

2. Splines: OSB, beveled block splines, or surface splines for use in joining SIPs shall be supplied by SIPs manufacturer.
3. Fasteners: Corrosion resistant SIP screws compatible with SIP system shall be provided by the SIPs manufacturer.

   a. SIP TP screws for attachment to wood members
   b. SIP HD screws for attachment to metal members (16 gauge to 3/16")
   c. SIP LD screws for attachment to metal decks (18 gauge or thinner)
   d. 3" SIP washer plates should be used with each SIP screw.

4. SIP Sealant: Shall be specifically designed for use with SIPs. Sealant must be compatible with all components of the SIP. Sealant shall be provided by the SIP manufacturer.
5. Dimensional Lumber: SPF #2 or better, or engineered equivalent unless otherwise required by structural drawings.
6. Vapor Barrier SIP Tape: Low VOC, Moisture Vapor Transmission: ASTM E 96-53 (Method E) - .012 perms, min., 4 inch wide for use on SIP joints as specified by designer. SIP Tape shall be supplied by the SIP manufacturer.
7. Fabrication: SIPs shall be supplier 100% pre-fabricated using CNC machinery
8. Sizes: SIPs shall be fabricated in accordance width approved Shop Drawing.
9. Thermal Resistance, R-value at 40˚ F.

   a. R-value as required for each area of construction.

      1) 4 1/2" thick SIP with R-value of 16.74
      2) 6 1/2" thick SIP with R-value of 25.08
      3) 8 1/4" thick SIP with R-value of 32.38
      4) 10 1/4" thick SIP with R-value of 40.72
      5) 12 1/4" thick SIP with R-value of 49.06

B. Related Materials: Refer to other sections for related material as follows:

1. Dimensional Lumber: SPF #2 or better or pre-engineered equivalent: Refer to Section 06 10 00 – Rough Carpentry.

C. Source Quality:

1. Source Quality Assurance: Each SIP component required shall be supplied by SIP manufacturer and shall be obtained from selected SIP manufacturer or its approved supplier.
2. Each SIP shall be labeled indicating NTA Third Party certification.
3. Provide evidence of NTA Third Party inspection and labeling of all insulation used in manufacture of SIPs.
4. SIP manufacturer shall provide lamination and R-value warranty documents for building owner acceptance and execution. Manufacturer's standard form will be submitted.
5. Provide SIPs with treated EPS for termite resistance. Treatment shall be EPA registered with treatment efficacy substantiated by independent research and ongoing in-plant testing.
6. Provide SIPs with factory applied No-Burn coating for thermal barrier, and mold resistance.
7. Provide SIPs that are pre-fabricated on CNC machinery. Hand cut SIPs shall not be allowed due to tolerance and fit issues.
8. Dimensional Tolerance – shall comply with values listed in the manufacturer's Quality Control Manual.
9. Source Quality: Obtain SIPs from a single manufacturer.

2.05 FASTENERS

A. Common Nails: ASTM F1667.

B. Panel Screws: screws with pancake head, minimal thread diameter 0.255 inches, minimum shank diameter 0.190 inches and a minimum head diameter 0.625 inches.

PART 3 – EXECUTION

3.01 PREPARATION

A. Site verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instruction.

1. Verify conditions of foundation/structural system/substrate and other conditions which affect installation of SIPs. Any adverse conditions shall be reported in writing. Do not proceed with installation until adverse conditions are corrected.

3.02 INSTALLATION

A. Installation is to be done by SIP manufacturer certified installer.

B. Complete installation recommendations are available from the manufacturer. SIP weight and contractor preference will dictate the erection method used. The use of a crane or lift truck may be required for SIP placement. Consult with SIP manufacturer for recommended handling methods. Lifting plates are available. from the SIP manufacturer. Supplementary lifting clamps and attachments to be provided by the contractor.

C. SIP Supports: Provide level and square foundation/structural system/substrate that support wall and/or roof SIPs. For wall SIPs, hold sill plate back from edge 7/16". Drill 1-1/2" diameter access holes in plating to align with electrical wire chases in SIPs. Provide adequate bracing of SIPs during erection. Remove debris from plate area prior to SIP placement.

D. SIP Fastening: Connect SIPs using nails as shown on installation drawing. Screws or staples of equal strength may be substituted for nail as specified by an engineer. SIP sealant must be used together with each fastening technique. Where Sip Screw Fasteners are used, provide minimum of 1" penetration into support. Join SIPs using splines. Secure attachment with nails, staples, or screws, and SIP sealant. Apply SIP sealant following SIP manufacturer recommendations.

E. SIP Tape: Provide SIP Tape at joint between SIP roof panels and at intersection of SIP roof and wall.

F. Restrictions: Do not install SIPs directly on concrete. Do not put plumbing in SIPs without consulting SIP manufacturer. Do not overcut skins for field-cut opening and do not cut skins for electrical chases. SIPs shall be protected from exposure to solvent and their vapors that damage the EPS foam core. Contact SIP manufacturer for approval before field modifying SIPs.

G. Remove and replace any SIPs which have become excessively wet or damaged before proceeding with installation of additional SIPs or other work.

3.03 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

B. Roof SIPs: Protect roof SIPs from weather by roofing material to provide temporary protection at the end of the day or when rain or snow is imminent. After installation, cover SIPs to prevent contact with water on each exposed SIP edge and face.

END OF SECTION

SECTION 06 15 19
SOLID TIMBER DECKING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and materials required to furnish and install the timber decking shown on the Drawings and required by these Specifications.

B. Related Sections: Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
   1. Section 06 18 10, "Glued Laminated Timbers"

1.02 QUALITY ASSURANCE

A. Reference Standards:
   1. By the American Wood Council:
      a. National Design Specification for Wood Construction, 2015 Edition.
   2. By the American Institute of Timber Construction:
      a. AITC 112-93, Standard for Tongue-and-Groove Heavy Timber Roof Decking.

B. Manufacturer's Qualifications: Minimum of five (5) years' experience in the manufacture of units similar to those required for this project.

1.03 SUBMITTALS

A. Certification of Experience: Submit written summary of plant, equipment, personnel, and previous projects which demonstrate the qualifications of the manufacturer.

B. Shop Drawings:
   1. Indicate material species, stress characteristics and finish.
   2. Indicate erection procedures for controlled random layup.
   3. Indicate nailing schedule.
   4. Notwithstanding any other requirements specified elsewhere in these Specifications, one electronic copy of the shop drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Wrap decking in bundles with heavy water-resistant paper.

B. Storage: Store on blocking at least 8 inches above ground. Slit or puncture wrapping to permit drainage.

C. Handling: Avoid any practice which would damage appearance or performance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumbers: Southern Pine or Douglas Fir. Nominal thickness 2 inches. Actual thickness 1 1/2 inches minimum.

B. Quality: "Select" where exposed to view, and "Commercial" where concealed, per AITC 112-93.

C. Moisture Content: 15% maximum.

D. Lengths: Controlled random layup, per AITC 112-93.

E. Finish: Penetrating sealer and end sealer compatible with stain specified elsewhere. (Seal all deck units, regardless of whether they are exposed to view.)

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning the work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section. This includes lines and grades of all supporting members.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 INSTALLATION

A. Install with pattern faces down and tongues up on sloped roofs.

B. Attach each course to each supporting member with one toenail through the tongue and one face nail using 16d common nails.

END OF SECTION

SECTION 06 16 13

INSULATING SHEATHING AND RAINSCREEN

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes insulating wall sheathing with integral water-resistive barrier and air barrier and includes:

1. Self-adhering flexible flashing.
2. Liquid-applied flashing membrane.
3. Fabric faced drainage and ventilation mat (Rainscreen).

1.02 REFERENCES

A. American Society of Mechanical Engineers (ASME)

1. ASME B18.6.1 - Wood Screws (Inch Series)

B. ASTM International (ASTM):

1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials
3. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings
4. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
5. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

C. US Department of Commerce (DOC):

1. DOC PS 2 - Performance Standard for Wood-Based Structural Panels

D. International Code Council (ICC)

1. ICC IBC - International Building Code

E. ICC Evaluation Service, Inc. (ICC-ES):

1. ICC-ES AC38 - Acceptance Criteria for Weather-Resistive Barriers
2. ICC-ES AC116 - Acceptance Criteria for Nails and Spikes
3. ICC-ES AC148 - Acceptance Criteria For Flexible Flashing Materials
4. ICC-ES AC201 - Acceptance Criteria for Staples
5. ICC-ES AC310 - Acceptance Criteria for Water-Resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-Resistive Barriers
6. ICC-ES ESR-1539 - Power Driven Staples and Nails for Use in Engineered and Non-Engineered Connections
7. ICC-ES NER-272 - Power Driven Staples and Nails for Use in All Types of Building Construction

F. International Association of Plumbing and Mechanical Officials (IAPMO)

1. IAPMO ER365 (ZIP System Stretch Tape)

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. For each type of sheathing product specified.
2. For each rainscreen assembly component, and accessory product. Include manufacturer's technical data indicating performance properties.

C. Shop Drawings: Indicating location and extent of rainscreen assembly, accessories, and assemblies. Include details of joints, corners, and penetrations.

D. For panels with integral water resistive barrier, include data on air/-moisture-infiltration protection based on testing according to referencing standards.

1.04 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: From ICC-ES, for wood sheathing and seam tape.

B. Product Certifications: From manufacturer, indicating that sheathing products comply with ICC-ES AC269 and ICC-ES AC310.

1.05 CLOSEOUT SUBMITTALS

A. Warranty: Executed copy of manufacturer special warranties.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide wood products from manufacturer certified by SFI, FSC, or comparable sustainable forestry program acceptable to Architect.

B. Single Source Limitations: Provide wall sheathing/weather barrier by a single manufacturer.

C. Provide wall sheathing products meeting requirements for water-resistive barrier in accordance with ICC-ES AC310.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Coordination.

E. Drainage and Ventilation Mat meeting requirement for second layer of Weather Resistant Barrier under absorptive cladding as required by International Building Code and in accordance with ICC – ESR 5270.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Outdoor Storage. Comply with manufacturer's recommendations and as follows:

1. Set panel bundles on supports to keep off ground.
2. Cover panels loosely with waterproof protective material.
3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.08 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which sheathing manufacturer agrees to repair or replace sheathing products that demonstrate deterioration or failure under normal use due to manufacturing defects within warranty period specified, when installed according to manufacturer's instructions.

1. Warranty Period for Sheathing Products: 30 years following date of Substantial Completion.
2. Warranty Conditions: Special warranties exclude deterioration or failure due to structural movement resulting in stresses on sheathing products exceeding manufacturer's written specifications, or due to air or moisture infiltration resulting from cladding failure or mechanical damage.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Provide weather barrier sheathing products manufactured by Huber Engineered Woods LLC, Charlotte NC.

2.02 PERFORMANCE REQUIREMENTS

A. Single Source Limitations: Provide wall sheathing with integral weather-resistive barrier and drainage and ventilation mat by a single manufacturer.

B. Sheathing Air-Barrier Assembly Air Leakage: Less than 0.04 cfm/sq. ft. at 1.57 lbf/sq. ft. (0.2 L/s x sq. m at 75 Pa), per ASTM E2357.

C. Drainage and Ventilation Mat – Water-Resistive Barrier: Passes requirements as a Water-Resistive Barrier in accordance with ASTM E2556.

D. Drainage and Ventilation Mat Water-Vapor Permeance, Facer: Minimum 7 perms when tested in accordance with ASTM E96.

2.03 MATERIALS

A. Oriented Strand Board: DOC PS 2, made with binder containing no added urea formaldehyde.

B. Rigid Foam Plastic Insulating Board: Rigid polyisocyanurate foam core complying with ASTM C1289 Type II, Class 2, and ICC-ES AC12, with coated glass fiber facers on both sides, with the following characteristics:

1. Nominal Density: 2.0 pcf
2. Compressive Strength, ASTM D1621: Not less than 20 psi.
3. Vapor Permeance, ASTM E96/E96M: Less than 1.0 perm.
4. Edge Configuration: Square finished.

2.04 COMPOSITE INSULATING WALL SHEATHING

A. Composite Insulating Wall Sheathing: Oriented-strand-board Exposure 1 sheathing 7/16 inch thick, with factory-laminated water-resistive barrier exterior facer, and with rigid foam plastic insulating board laminated to interior face.

1. Basis-of-Design Product: Provide Huber Engineered Woods LLC; ZIP System R Sheathing.
2. Span Rating and Performance Category of Sheathing Layer: Not less than 24/16; 7/16 Performance Category.
3. Thicknesses: As detailed.
4. Thermal Resistivity (R Value): 6.6 deg F x h x sq. ft./Btu x in. at 75 deg F
5. Edge Profile: Square edge.
6. Exterior Facer: Medium-density, phenolic-impregnated polymer-modified sheet material meeting requirements for ASTM D779 Grade D weather-resistive barrier in accordance with ICC AC38 and AC310, with fastener spacing symbols on exterior facer for 16-inch and 24-inch on center spacing, with the following characteristics:

    a. Water Resistance of Coatings, ASTM D2247: Pass 14 day exposure test.
    b. Moisture Vapor Transmission, ASTM E96: Not less than 12 perms.
    c. Water Penetration, ASTM E331: Pass at 2.86 lbf/sq. ft.
    d. Wind Driven Rain, TAS-100: Pass.
    e. Accelerated Weathering, ASTM G154: Pass.

2.05 SHEATHING FASTENERS

A. Fasteners, General: Size and type complying with manufacturer's written instructions for Project conditions and requirements of authorities having jurisdiction.

1. Corrosion Resistance: Hot-dip zinc coating, ASTM A153/A153M

B. Nails, Brads, and Staples: Conform with ICC AC116 and ICC AC201.

C. Power-Driven Fasteners: ICC-ES ESR-1539 - Power Driven Staples and Nails for Use in Engineered and Non-Engineered Connections or ICC-ES NER-272 - Power Driven Staples and Nails for Use in All Types of Building Construction .

D. Wood Screws: ASME B18.6.1.

2.06 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIAL

A. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting ICC-ES AC148, and tested as part of an assembly meeting performance requirements.

1. Basis-of-Design Product: Provide Huber Engineered Woods; ZIP System Tape.
2. Characteristics
    a. Adhesive type: Acrylic
3. Thickness: 0.012 inch
4. Tensile Strength: 938 psi
5. Elongation: 400-800 percent
6. Complies with AAMA 711

B. Liquid-Applied Flashing Membrane: Gun-grade, cold-applied, silyl-terminated polyether (STPE) liquid flashing membrane compatible with sheathing/weather barrier and self-adhering seam and flashing tape, and tested as part of an assembly meeting performance requirements. Follow manufacturer's recommendation for integration with ZIP System Tape.

1. Basis-of-Design Product: Provide Huber Engineered Woods; ZIP System Liquid Flash.
2. Characteristics:
    a. Composition: Single component silyl-terminated polymer (STP)
    b. Application Temperature Range: Between 35 Deg F (2 Deg C) and 110 Deg F (43 Deg C) surface and ambient.
    c. VOC Content: 30 g/L
    d. Hardness, Shore A: 40 to 45 in accordance with *ASTM C661.*
    e. Tensile Strength: 75 psi in accordance with *ASTM D412.*
    f. Elongation at Break: 225 percent in accordance with *ASTM D412*

C. Self-Adhering Flexible Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, seam tape consisting of polyolefin film with acrylic adhesive, meeting ICC-ES AC148, and tested as part of an assembly meeting performance requirements.

1. Basis-of-Design Product: Provide Huber Engineered Woods; ZIP System Stretch Tape.
2. Characteristics:
    a. Adhesive type: Acrylic
    b. Thickness: 0.042 inch (1.067 mm).
    c. Tensile Strength: 225 psi
    d. Elongation: 800-1200 percent
    e. Complies with *AAMA 711*

2.07 DRAINAGE AND VENTILATION MAT

A. Entangled polymer mesh drainage medium with fabric covering to be used as secondary layer of water-resistive barrier.

1. Basis-of-Design: Huber Engineered Woods LLC; ZIP System™ Rainscreen
2. Characteristics:
    a. Mat Exposure Period: Not more than 90 days
    b. Thickness: not less than ¼ inch
    c. Mesh Composition: Polymeric
    d. Drainage Efficiency: greater than 90% Passes in accordance with ASTM E2273.

B. Drainage and Ventilation Mat Fasteners:

1. Minimum 5/8-inch cap nails or cap staples, corrosion resistant.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine framing spacing and alignment to determine if work is ready to receive sheathing. Proceed with sheathing work once conditions meet requirements.

3.02 SHEATHING INSTALLATION

A. Install sheathing panels in accordance with manufacturer's written instructions, requirements of applicable Evaluation Reports, and requirements of authorities having jurisdiction.

B. Air and Moisture Barrier: Coordinate sheathing installation with flashing and joint sealant sequencing and installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.

C. Do not bridge expansion joints; allow joint spacing equal to spacing of structural supports.

D. Install panels with laminated facer to exterior. Stagger end joints of adjacent panel runs. Support all panel edges.

1. Space square-edged panels 0.125 inch (3 mm).
2. Butt edges of self-spacing edge panels.

E. Attach sheathing panels securely to substrate with manufacturer-approved fasteners in compliance with the following:

1. ICC-ES ESR-1539 or ICC-NES NER-272 for power-driven fasteners.
2. OBC: Table 2304.10.1 Fastening Schedule.

3.03 SHEATHING SEAM AND PENETRATION JOINT TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Assembly continuity: Coordinate sheathing installation with flashing and joint sealant sequencing and installation and with adjacent building air and moisture barrier components to provide complete, continuous air- and moisture- barrier.
2. Tape panel seams, penetrations, and facer defects or cracks with self-adhering seam tape to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of ICC-ES applicable to tape application.
    a. Product: ZIP System™ Flashing Tape
3. Flash penetrations, gaps, and cracks with liquid-applied flashing membrane to form continuous weathertight surface. Apply according to manufacturer's written instructions. Follow manufacturer’s recommendation for integration with self-adhering seam tape.
    a. Product: ZIP System™ Liquid Flash
4. Tape window and doors openings and radius penetrations with self-adhering flexible flashing tape to form continuous weathertight surface. Apply tape according to manufacturer’s written instructions and requirements of ICC-AC applicable to tape application.
    a. Product: ZIP System™ Stretch Tape

3.04 FLEXIBLE OR LIQUID-APPLIED FLASHING INSTALLATION

A. Apply tape flexible flashing or membrane where indicated to comply with manufacturer's written instructions.

1. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
2. Width for flexible flashing: 6 inch (154.4 mm).
3. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer’s written instructions. Follow manufacturer’s recommendation for integration with seam and flashing tape.

B. Apply liquid applied flashing membrane where indicated to comply with manufacturer's written instructions.

1. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer's written instructions. Follow manufacturer’s recommendation for integration with ZIP System Tape.
2. After liquid applied flashing membrane has been applied, tool wet product with a plastic spreader, putty knife, or similar tool to ensure that flashing is opaque and substrate is no longer visible.
3. Minimum Thickness for Liquid Flashing: 12 mils (0.3 mm).

4. Apply liquid flashing membrane according to manufacturer's written instructions. Follow manufacturer's recommendations for integration with seam and flashing tape or flexible flashing tape.

C. Apply flexible flashing tape where indicated to comply with manufacturer's written instructions.

1. Apply ZIP System Stretch Tape around window and window frames, door frames, radius fenestrations and wall penetrations to form continuous weathertight surface. Apply tape according to manufacturer's written instructions and requirements of IAPMO ER365 applicable to tape application.
2. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
3. Width of flexible flashing: 6 inches (154.4 mm) or 10 inches (254 mm).

3.05 DRAINAGE/VENTILATION MAT INSTALLATION

A. General: Install drainage mat panels in accordance with manufacturer's written instructions, and requirements of authorities having jurisdiction.

1. Start at bottom of wall and position drainage mat against the wall with the mesh against the wall sheathing.
2. Trim selvage edge along bottom course and directly above transitions to maintain drainage. Shingle each course of drainage mat over previous course, with full overlap of selvage edge.
3. Mechanically fasten drainage mat, spacing fasteners not more than 24 inches apart in both horizontal and vertical pattern. Avoid fastening mesh through flashing.

B. Drainage and Ventilation Mat Seam and Penetration Treatment:

1. Tape vertical seams of Drainage mat with self-adhering seam tape

a. ZIP System™ Flashing Tape.

END OF SECTION

SECTION 06 17 13
LAMINATED VENEER LUMBER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and material to furnish and install the laminated veneer lumber members shown on the Drawings and required by these Specifications.

B. Related Sections: Carefully examine all other Sections and all Drawings for related work, which includes but is not limited to:
   1. Section 05 12 00, "Structural Steel"
   2. Section 06 11 00, "Structural Lumber"

1.02 SUBMITTALS

A. Shop Drawings:
   1. Indicate mark, number, type and location of all pieces.
   2. Indicate connection details and handling instructions.
   3. Notwithstanding any other requirements specified elsewhere in these Specifications, one electronic copy of the shop drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.

B. Submit, on request only, the manufacturer's standard published literature and load tables.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver lumber with setting drawings and/or installation instructions, sufficiently well-detailed for proper incorporation into the project.

B. Store off the ground on runners, bundled in an upright position, and protected from the weather.

C. Store and handle so as to avoid damage to the lumber. Replace damaged pieces.

PART 2 PRODUCTS

2.01 MATERIALS

A. Veneers: Ultrasonically graded for consistency, to achieve allowable unit stresses of 2000 psi in tension parallel to grain, 2800 psi in compression parallel to grain, 2500 psi in flexural tension and compression, and 2000 ksi in elastic modulus. Laminations to be between 1/8 inch and 1/10 inch thick.

B. Adhesive: Waterproof, consistent with the allowable stresses listed above.

2.02 FABRICATION

A. Laminate the veneers in a continuous press, of sufficient capacity to ensure uniform distribution of the adhesive.

B. Acceptable products include:
1. Microllam by Weyerhaeuser.
2. Versa-Lam or GP Lam by Boise Cascade.
3. Red Lam by Redbuilt.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning the work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for the proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. DO NOT cut, notch, or otherwise modify any member except as shown on the shop drawings, for any reason.

B. Erect in strict accordance with the Drawings, and the manufacturer's instructions.

C. Ensure that construction loads do not exceed the design carrying capacity of the members.

3.03 CONTRACTOR'S NOTIFICATION

A. Notify the Architect and the manufacturer immediately when a member is damaged, so that repair or replacement can be made.

B. Notify the manufacturer prior to enclosing the work of this Section, to afford the opportunity for review.

END OF SECTION

SECTION 06 17 53
PREFABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: All labor and materials required to furnish and install the wood trusses shown on the Drawings and as required by these Specifications. Include all bridging, lateral restraint, bracing, blocking, anchors, extensions, etc. required for a complete installation.

B. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

C. Related Sections: Carefully examine all other Sections and all Drawings for related work which includes but is not limited to:
1. Division 04, Masonry
2. Section 06 11 00, "Structural Lumber"

D. Inspection required by this Section to be at the Owner's expense.

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. National Design Specification for Wood Construction, 2015 Edition, by the American Wood Council.
2. National Design Standard for Metal Plate Connected Wood Trusses, ANSI/TPI 1-2014 by the Truss Plate Institute.
3. Guide to Good Practice for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses, BCSI 2018 by the Truss Plate Institute and the Wood Truss Council of America.

B. Manufacturer's Qualifications: Minimum three (3) years' experience for manufacturing comparable wood trusses.

C. Tolerances:
1. Outside Dimensions: ±1/16 inch up to 20 feet length; for greater lengths, 1/16 inch per 20 feet length.
2. Square End Cuts: square within 1/16 inch per foot of depth and width.
3. Connector Locations: ±1/4 inch from locations shown on shop drawings.

1.03 SUBMITTALS

A. Shop Drawings:
1. Indicate mark, number, and location of all trusses.

2. Indicate all member sizes for each truss mark, including chords, webs, and connectors.
3. Indicate bridging, bearing details, anchorage, bracing, etc.
4. Indicate handling instructions and erection sequence, if critical.
5. Notwithstanding any other requirements specified elsewhere in these specifications, one electronic copy of the shop drawings shall be submitted for approval. One electronic copy will be returned to the Contractor, who will make and distribute as many copies as needed. Only prints with the approval stamp printed on them shall be permitted on the site.
6. Shop drawings shall exhibit the seal of the Engineer responsible for the truss design.
7. Shop drawings shall exhibit the seal of the Engineer responsible for lateral restraint bracing design, both temporary and permanent, including spans over 60 feet.

B. Design Analysis:
1. Submit stress diagram indicating design force in each truss member, or submit a printout of the computer design.

C. Certification: Submit, on request only, written certification that the trusses will sustain the design loads at the specified moisture content.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handle trusses with care, following the manufacturer's instructions.

B. Store in upright position.

C. Provide bearing supports and bracing to avoid damage from bending or overturning.

D. Protect from construction operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber:
1. Maximum moisture content 19%.
2. Design to be based on Southern Pine #2.

B. Metal connector plates (internal connections):
1. Galvanized steel sheet, ASTM A653/A653M-19, Grade 33, coating class G60.
2. Manufacture with holes, plugs, teeth, or prongs uniformly spaced and formed.

C. Metal Connector Plates (external connection): Use products of the Simpson Company or equivalent.

2.02 DESIGN

A. Sizes shown on the Drawings are to be considered minimums.

B. Final design of members and connections is to be by a professional engineer, registered in Ohio, experienced in similar design, retained by the manufacturer.

C. Overall dimensions and loads are shown on the Drawings.

D. Where dimensions shown on the Drawings exceed practical shipping size, trusses may be designed using "piggy-back" arrangement. Design field connections to transfer all design forces, including wind uplift.

E. Maximum live load deflection is to be L/360.

F. Maximum total load deflection is to be L/240.

G. Maximum total horizontal deflection is to be 3/4 inch.

H. Maximum live load horizontal deflection is to be 1/2 inch.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to beginning work of this Section, verify that the installed work of other trades is complete and correct to the extent necessary for proper execution of the work of this Section.

B. In the event of discrepancies, immediately notify the Architect. Do not proceed with work affected by the discrepancies until they have been resolved.

3.02 ERECTION

A. Hoist trusses into position with cables, and spreader bars where required, at the designated lift points.

B. Install temporary horizontal and cross bracing to keep trusses plumb and in a safe condition until permanent bracing is installed.

C. Install permanent bracing and related components prior to application of loads to trusses.

3.03 FIELD QUALITY CONTROL

A. Inspection agency shall perform the following:
   1. Where a truss clear span is 60 feet or greater, the inspector shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes items of woodwork including:

1. Items of interior woodwork including interior standing and running trim
2. Display cases
3. Hardware and accessories
4. Field Installation of carpentry.

B. Related Sections include the following:

1. Section 06 10 00 – Rough Carpentry for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
2. Section 09 93 00 – Staining and Transparent Finishing

1.02 REFERENCES

A. Reference Standards: In addition to requirements shown or specified, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:

1. Architectural Woodwork Standards, Edition 2, dated October 1, 2014, published jointly by the Architectural Woodwork Institute (AWI), the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and the Woodwork Institute (WI).

1.03 DEFINITIONS

A. Architectural carpentry includes wood furring, blocking, shims, and hanging strips for installing carpentry items unless concealed within other construction before carpentry installation.

B. Concealed Surfaces: Sleepers, web frames, dust panels and other surfaces not usually visible after installation.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Samples: Submit samples of woodwork materials, accessories, and components of wood fabrications.

1. Lumber and panel products with transparent and stained finish, 50 sq. in. for lumber and 8 by 10 inches for panels, for each finish system and color, with half of the exposed surface finished.

1.05 QUALITY ASSURANCE

A. Quality Standard: Conform to “latest edition” *Architectural Woodwork Standards* as adopted by Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturer’s Association of Canada and Woodwork Institute for grades of interior architectural woodwork, construction, finishes, installation, and other requirements.

B. Fabrication and Installation Standards: Fabricate and install in accordance with Architectural Woodwork Standards, Edition 1 as listed below.

1. Lumber grades: AWS Section 3.
2. Panel products: AWS Section 4.
3. Interior millwork: AWS Section 6.

C. Installer Qualifications: An experienced installer who has completed finish carpentry similar in material, design, and extent to that indicated for this Project; and with a record of successful in- service performance; and one of the following:

1. Fabricator of woodwork for this Project.
2. Manufacturer-certified installer of woodwork products.

D. Single Source Responsibility: Obtain architectural woodwork from single source to ensure uniformity in quality, appearance and construction.

1. Fabricator is responsible for finishing and installation of woodwork.

E. Preinstallation Meeting: Prior to beginning any work, meet with the Architect to review the requirements of the contract documents.

1. Examine contract documents and submittals. Review coordination of related work, preliminary schedule, inspection and testing methods.
2. Document discussions in writing, including actions required, and distribute a copy of report to each meeting participant.
3. Before installation of woodwork, have the woodwork installer meet with installers of related and adjacent work to discuss sequence of installation, protective measures, and consequences of damage to woodwork.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with Section 01 60 00 and AWS Section 2 - Care and Storage.

1. Protect materials from damage, soiling, and deterioration during transit and storage.
2. Do not deliver woodwork materials until Project site conditions and operations which could damage, soil, or deteriorate work are complete. Woodwork shall not be delivered until mechanical system is operational i.e. weather / water tight and environmentally controlled. Building interior and designated and storage areas shall be sufficiently dry so that woodwork will not be damaged by excessive changes in atmospheric conditions.
3. Store products and materials in ventilated interior locations under constant minimum temperature and relative humidity.

B. Deliver woodwork to building after work involving wet material work has been completed in building space for at least 10 days.

C. Mold Prevention: Comply with Section 01 60 00 and AWS Section 2 - Care and Storage.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

1. Spaces shall be ready to receive woodwork. Temperature and humidity shall be stabilized in installation areas at approximate level that will prevail in building when occupied.
2. Building HVAC shall be fully operational prior to beginning installation. Failure to comply with this requirement shall be cause for rejection of the work.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurement before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Existing Conditions: Check door openings, passageways, elevators, etc. to be certain millwork items can be conveyed to proper location in finished Work. Schedule the installation of partitions and door frames to accommodate moving and placement of millwork.

1.08 COORDINATION

A. Coordinate work directly with other subcontractors as necessary to insure proper fitting, joining or to clearances of other work.

1. Obtain templates as required to insure proper fitting.
2. If required, do not install or close up areas of cabinetwork until utilities have been installed.

1.09 WARRANTY

A. Special Warranty: Prepare and submit in accordance with Section 01 77 00.

1. Warranty with provisions for repairing or replacing, at no additional cost to Owner, architectural woodwork items that exhibit defects in material or workmanship for two years.

PART 2 – PRODUCTS

2.01 GENERAL

A. Quality Standards: Materials and workmanship of woodwork shall comply with Custom Grade requirements of AWI Quality Standards, unless otherwise indicated.

2.02 MATERIALS

A. General: Provide materials that comply with requirements of AWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Lumber Standards: Comply with applicable provisions for grading and workmanship of AWI Quality Standards, Sections 100-T-1, 100-T-4, 100-T-5, Grade I and the requirements shown and specified, where standards conflict the more stringent shall apply. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. All lumber shall be kiln dried to the moisture content indicated in AWI Section 100-T-11.

C. Wood Products: Comply with the following:

1. Particleboard: ANSI A208.1, Grade M-2, with a minimum density of 45 pcf, internal bond of 65 psi, and minimum screw-holding capacity of 225 lbs. on faces and 200 lbs. on edges.
2. Softwood Plywood: DOC PS 1, Medium Density Overlay.

2.03 STANDING AND RUNNING TRIM FOR TRANSPARNT FINISH

A. Standing and Running Trim: Provide standing and running trim of the sizes, profiles, species and finish as specified as follows:

1. Lumber for Transparent Finish: Wood Species for Transparent Finish: Match existing cleaned barn wood materials.

B. Quality Standard: Comply with AWS Section 6.

1. Grade: Custom

C. Finger Jointing: Not permitted.

D. Profile: As indicated on drawings.

E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with exposed ends in finished work.

F. Provide sanded and ready for field finishing.

2.04 ACCESSORIES

A. Contact Adhesive: As recommended by woodwork fabricator to suit application.

1. Adhesive: Water-based, formaldehyde free, maximum of 20 g/L VOC content.

B. Fasteners: Size and type to suit application.

2.05 FABRICATION

A. Woodwork Grade: Provide AWS Custom-grade carpentry complying with referenced quality standard.

1. Provide wood veneers only within the range of the accepted samples, including providing select veneers if required to remain within that range.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated.

2.06 FASTENERS AND ANCHORAGES

A. Fasteners:

1. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements. For metal framing supports, provide screws as recommended by metal-framing manufacturer.
2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.

2.07 FINISHES

A. Back Priming: Prior to installation, back prime concealed faces of panels, moldings, and other thin wood, plywood, and panel material subject to warping and bowing. Apply 2 coats of sealer, primer, or suitable finish system to balance finish on exposed face. Refer to Section 09 91 00.

B. Preparation: Sand, seal, and prepare surfaces to receive uniform coatings free of blotches, inconsistent absorption, irregular sheen, and color variations.

C. Wood Putty Filler: Match color of finished wood.

D. Field Finished Wood Carpentry: Provide stained and transparent finish systems under work of Section 09 93 00.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Field Measurements: Take dimensions necessary before fabrication and installation.

C. Protect surrounding areas or surfaces to preclude damage during installation.

3.03 INSTALLATION OF FINISH CARPENTRY

A. Conform to AWI Architectural Woodwork Quality Standards and manufacturer’s instructions.

B. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

1. Distribute defects allowed in quality grade to best overall advantage when installing project assembled woodwork items.
2. Shim as required using concealed shims.
3. Before making cutouts, drill pilot holes at corners.
4. Tolerances for Field Assemblies/Joined Items:

a. Maximum Variation from True Position: 1/16 inch unless otherwise specified or required by AWS grade.

b. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch unless otherwise specified or required by AWI grade.

C. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

D. Field Fitting: Cut to fit and carefully scribe.

1. Where work abuts other finished surfaces, scribe and cut for accurate fit.
2. Do not use overlay trim pieces to cover joints.

3.04 STANDING AND RUNNING TRIM

A. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

B. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long, except where shorter single-length pieces are necessary.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

C. Use finish nails or finish head screws at face of finished installations except where washerhead or other exposed fastener is indicated. Use screws designed for each installation. Set nails and screws, countersink fastenings, and putty recesses, except use blind fastening where indicated or practical.

1. Countersink nails and screws.
2. Fill recessed heads with wood putty.
3. Space screws and nails at equal intervals at spacing to fasten permanently and securely in place, except not less than one fastener at each end and at center of each item.

D. Touch up finishing work specified in this Section after installation of carpentry. Fill nail holes with matching filler where exposed.

E. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes

3.05 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.06 CLEANING AND PROTECTION

A. Protect carpentry from marring, defacement, or other damage until final completion.

B. Clean spaces of debris and vacuum and wipe down carpentry. Leave in condition ready for use.

END OF SECTION

SECTION 06 43 00

WOOD STAIRS AND RAILINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes providing all labor, equipment and materials required to provide wood stairs and all anchorage as shown on the drawings and required for a complete stair system; including:

1. Wood stair treads and stringers.
2. Metal anchorage.

B. Related Sections: The following Sections contain requirements that may relate to this Section:

1. Section 05 50 00 – Metal Fabrications.
2. Section 09 93 23 – Interior Staining and Finishing

1.02 REFERENCES

A. NDS: National Design Specification.

B. ALSC: American Lumber Standards Committee).

1. PS 20 – American Softwood Lumber Standard.

C. NeLMA: Northeastern Lumber Manufacturers' Association.

D. NLGA: National Lumber Grades Authority.

E. SPIB: The Southern Pine Inspection Bureau.

F. WCLIB: West Coast Lumber Inspection Bureau.

G. WWPA: Western Wood Products Association.

H. AWPA: American Wood Protection Association.

1.03 ACTION SUBMITTALS

A. General: Submit the following for the Authority’s review and approval:

1. Product data for wood materials.
2. Product data for wood treatment material.
3. Structural data for wood.

B. Shop drawings showing field verified dimensions for the extent of the materials including structural framing, support and bearing details and conditions, elevations and other details and dimensions. Show details for support and attachment of members.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

1.05 QUALITY ASSURANCE

A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

B. Fabricator Qualifications: Shop that employs skilled workers who fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Installer Qualifications: Fabricator of products or approved by fabricator.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. For pressure treated materials, provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials. Place spacers between each bundle to provide air circulation.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wood stairs and railings until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where wood stairs and railings are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where wood stairs and railings are indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 – PRODUCTS

2.01 LUMBER

A. Lumber for treads and stringers to be Dense Select Structural Grade Yellow Pine, conforming to Standard Grading Rules for Southern Pine Lumber, of the Southern Pine Inspection Bureau, except as amended herein. All lumber shall be Kiln Dried (KD) and dressed 4 sides to the dimensions shown on the drawings.

B. Lumber:

1. Moisture Content: Kiln dried to a moisture content of 19 percent.
2. Dimension Tolerance: Plus or minimum 0.04-inch in both width and thickness (measured at 30 percent moisture content).
3. Fabricate from actual or net dimension lumber sizes indicated and into shapes shown.

C. Fasteners:

1. Screws, bolts, nuts and washers as indicated on the drawings to be hot dip galvanized or stainless steel as directed by the Authority.
2. Fasteners shall be flat head wood screws with sufficient length to penetrate into supporting member. Screws to be full thread. Follow manufacturer’s recommendations. Provide three (3) screws minimum at each support location.

2.02 WOOD STAIRS AND RAILINGS

A. Quality Standard: Comply with the "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

B. Wood for Transparent Finish: Red-oak treads; plain-sawn, oak handrails.

C. Finishes for Stair Parts: As follows:

1. Treads: Transparent
2. Exposed Stringers: Transparent
3. Handrails: Transparent

D. Wood Moisture Content: 6 to 11 percent.

E. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

2.03 FABRICATION

A. Fabricate wood stairs and railings to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Configuration of handrail as detailed on Drawings. Provide all mounting accessories required for complete installation.

D. Cut carriages to accurately fit treads.

1. Fabricate stairs with treads no more than 1/8 inch from indicated position and no more than 1/16 inch out of relative position for adjacent treads.

2.04 FINISHING

A. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

B. Finish transparent-finished wood stairs and railings at fabrication shop as specified in this Section. Refer to Section 09 93 23 – Interior Staining and Finishing for field finishing architectural woodwork.

C. Transparent Finish: Section 09 93 23 – Interior Staining and Finishing.

1. Grade: Same as item to be finished.
2. Finish: System 12, water-based polyurethane.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before finishing.
4. Filled Finish for Open-Grain Woods: Apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess.
5. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 – EXECUTION

3.01 PREPARATION

A. Before installation, condition wood stairs and railings to average prevailing humidity conditions in installation areas.

3.02 INSTALLATION

A. Grade: Install wood stairs and railings to comply with same grade as item to be installed.

B. Assemble wood stairs and railings and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Stairs: Securely anchor carriages to supporting substrates. Install stairs with treads no more than 1/8 inch from indicated position.

D. Railings:

1. General: Install rails with no more than 1/8 inch in 96-inch variation from a straight line.
2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.
3. Wall Rails: Support rails on indicated metal brackets securely fastened to wall framing.

a. Space rail brackets not more than 3’-6” o.c. where wall-mounted; newel mounted otherwise.

E. Touch up finishing work specified in this Section after installation of wood stairs and railings. Fill nail holes with matching filler where exposed.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective wood stairs and railings, where possible, to eliminate functional and visual defects; where not possible to repair, replace wood stairs and railings. Adjust joinery for uniform appearance.

B. Clean wood stairs and railings on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 49 19

WOOD SHUTTERS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes shop fabricated and finished items of woodwork including:

1. Interior wood shutters sized to fit pass-through opening
2. Shop finishing of woodwork
3. Mounting hardware and accessories.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details. Include:

1. Wood species.
2. Finishing product materials.

C. Shop drawings: Provide:

1. Elevations and sections. List each required size separately.
2. Details of assembly.
3. Make field measurements of each window size and type. Include field measurements on shop drawings.

D. Samples:

1. For Initial Selection: For each type of product involving selection of colors, profiles, or textures.
2. For Verification: Finished shutter corner assembly, 40 square inches minimum; provide finish samples on correct wood species.

E. Warranties: Provide copy sample manufacturer's warranties.

1.03 QUALITY ASSURANCE

A. Comply with Architectural Woodwork Standards, Edition 1, dated October 1, 2009, published jointly by the Architectural Woodwork Institute (AWI), the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and the Woodwork Institute (WI) for grades of architectural casework indicated for construction, finishes, installation, and other requirements.

1. Reference: AWI Woodwork standards: Section 6 - Millwork

B. Fabrication and Installation Standards: Fabricate and install in accordance with Architectural Woodwork Standards, Edition 1 as listed below.

1. Lumber grades: AWS Section 3.
2. Panel products: AWS Section 4.
3. Installation: AWS Appendix B - 12.

C. Fabricator/Installer Qualifications: An experienced installer who has completed finish carpentry similar in material, design, and extent to that indicated for this Project; and with a record of successful in- service performance; and one of the following:

1. Fabricator of woodwork for this Project.
2. Installer Qualifications: Fabricator of products

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

C. Field Measurements: Where woodwork is indicated to fit to other construction, and pre-finished items to be built-in, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 – PRODUCTS

2.01 WOOD MATERIALS

A. General: Provide materials that comply with requirements of AWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Lumber Standards: Comply with applicable provisions for grading and workmanship of AWI Quality Standards, Sections 100-T-1, 100-T-4, 100-T-5, Grade I and the requirements shown and specified, where standards conflict the more stringent shall apply. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. All lumber shall be kiln dried to the moisture content indicated in AWI Section 100-T-11.

C. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Material: Clear White pine
2. Shutter thickness: 1.125 inch.
3. Louvers: Open to permit air passage, 1.375 inch.
4. Center rail: No
5. Profile: Flush stiles and rails.
6. Height and Width: As shown, and as required by opening size.
7. Wood Moisture Content: 7 to 12 percent.
8. Finish: Transparent as selected.

D. Hardware: Provide all required hardware for operation and securing shutters. Includes fabricators/manufacturers standard including the following:

1. Track with rollers and brackets
2. Knobs
3. Hinges
4. Pivots and brackets

5.

2.02 INSTALLATION MATERIALS

A. Nails and screws: Bronze, Aluminum, hot-dip galvanized or stainless steel.

1. Provide self-drilling screws for metal-framing supports.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip-galvanized anchors and inserts unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Quality Standard: Install wood shutters to comply with same grade as item to be installed, and as follows:

1. Install wood shutters true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
2. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
3. Examine materials before installation. Reject materials that are damaged.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Woodwork shall be properly framed, closely fitted and accurately set to the required lines and levels and shall be rigidly secured in place. Shim as required using concealed shims to achieve specified tolerances.

3.02 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 07 13 00

BITUMINOUS SHEET WATERPROOFING

PART 1 – GENERAL

1.01 SUMMARY

A. The work of this Section consists of waterproofing system(s) where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.

1. Self-Adhering waterproofing in vertical applications used as a tie-in of new construction substrate to existing substrate.
2. All required fillets, counter flashing, primers and adhesives, applied to exterior surfaces of below grade slabs and foundation walls.

B. Factory representative field inspections of installed waterproofing.

C. Related Sections:

1. Section 03 30 00 – Cast-In-Place Concrete

1.02 REFERENCES

A. ASTM International:

1. C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
2. D 412 - Standard Test Methods for Rubber Properties in Tension.
3. D 570 - Standard Test Method for Water Absorption of Plastics.
4. D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
5. D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
6. D 3767 -Standard Practice for Rubber - Measurements of Dimensions.
7. D 5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
8. E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
9. E 154 -Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product data:

1. Manufacturer’s standard catalog cut sheets indicating product to be used, conformance to specifications, and installation procedures and details.
2. Submit test data from manufacturer on proposed waterproofing system.

C. Project information:

1. Manufacturer certification of installer qualifications.
2. Product test reports from qualified independent testing agency evidencing compliance of waterproofing with physical properties and other requirements based on comprehensive testing in accordance with specified test methods within previous 5 years.

D. Shop Drawings:

1. Submit shop drawings showing penetrations, sheet layout, special conditions and details not standard with the manufacturer.

E. Contract closeout information:

1. Warranty.

1.04 QUALIFICATIONS

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years' experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

1. Submit letter from manufacturer stating that the applicator is certified to apply the system specified in this section.
2. Provide certification letter on manufacturer's letterhead and signed by an officer of the company.

B. Installer: A firm that has at least 5 years' experience in work of the type required by this section and with written documentation.

1.05 QUALITY ASSURANCE

A. Materials: For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

B. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

C. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.06 PRE-INSTALLATION MEETING

A. Hold pre-installation meeting directed by Contractor prior to beginning of waterproofing to discuss following as a minimum:

1. Contract Document requirements.
2. Extent of waterproofing.
3. Substrate conditions, preparation, pretreatment and curing periods.
4. Waterproofing manufacturer's specifications and details.
5. Special details, flashings, and termination provisions.
6. Installation procedures and schedule.
7. Inspection, testing, and repairs.
8. Protection from damage by other work and environmental exposures.

B. Attendance is recommended for:

1. Installing contractor.
2. Installer's superintendent.
3. Manufacturer's representative.
4. Supervisors of installers of substrates to receive waterproofing.
5. Supervisors of installers of construction to overlay waterproofing system.
6. Supervisors of other trades whose work may affect waterproofing system.
7. Independent testing agency's supervisor.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

1.08 PROJECT CONDITIONS

A. Verify suitability of substrate to accept installation.

1. Fill voids, thoroughly dry surface and remove dust.
2. Cure concrete surfaces for minimum 7 days prior to application of waterproofing.

B. Install only when surface temperatures are above 40 deg F.

C. Do not install on wet or frosted surface, or when rain or snow is expected.

D. Provide adequate ventilation during installation.

1.09 WARRANTY

A. Upon receipt of Project Closeout Form by Installer and upon receipt of Project Inspection Closeout Form by inspection firm, provide written manufacturers watertightness warranty in which Manufacturer will make or cause to be made repairs necessary to correct leaks to the System due to the following causes:

1. System deterioration as a result of ordinary wear and tear and the effects thereof; and
2. Improper workmanship during installation by the Installer.

B. Installer has performed repairs under the terms of its warranty (if any) covering the system.

C. Warranty does not include cost of removal and subsequent replacement of any equipment, materials, or other items that limit access, cover, or otherwise conceal the System.

D. Warranty Period: 10 years from date of Substantial Completion.

E. Maintenance Guaranty: The General Contractor, manufacturer and installing subcontractor shall furnish a written three (3) year guaranty on the complete membrane waterproofing installation. Submit the guaranty in triplicate.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:

1. Carlisle Coatings and Waterproofing, Inc., Wylie, TX.
2. GCP Applied Technologies Inc., Cambridge MA.
3. Henry Company, El Segundo CA.
4. Polyguard Products Inc. Ennis, TX.
5. W.R. Meadows, Hampshire, IL.

2.02 SELF-ADHERING WATERPROOFING

A. Self-Adhering Sheet Membrane Waterproofing: Bituthene® 3000/Low Temperature Membrane by GCP Applied Technologies; a self-adhesive, cold-applied composite sheet consisting of a thickness of 0.056 in. of rubberized asphalt and 0.004 in. of cross-laminated, high density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet, which is removed during installation. No special adhesive or heat shall be required to form laps:

1. Thickness: 1.5 mm (0.060 in.) nominal
2. Elongation: >300%
3. Tensile Strength: 34.5 MPa (5,000 lbs/in.^{2}) minimum
4. Resistance to Hydrostatic Head: >60 m (200 ft).
5. Puncture Resistance: 222 N (50 lbs) minimum
6. Permeance: <2.9 ng/m^{2}sPa (0.05 perms)
7. Water Absorption: <0.1%

B. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

2.03 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, nonbiodegradable, molded-plastic- sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

1. Prefabricated drainage composite for vertical applications:

    a. W. R. Grace Hydroduct 220 (vertical)

2.04 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Waterstop: Hydrophilic waterstop for joints in concrete walls and floors.

C. Primer: Liquid primer recommended for substrate by manufacturer of sheet waterproofing material.

D. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

E. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.

F. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

G. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

H. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

I. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self- adhering side.

J. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, and sound; ready to receive waterproofing sheet.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SUBSTRATE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

D. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

E. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to- deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 WATERPROOFING SHEET APPLICATION

A. Install waterproofing sheets according to waterproofing manufacturer's written instructions.

B. Vertical Applications: Install sheet membrane with waterproofing face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.

C. Horizontal Applications: Install sheet membrane with Waterproofing face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps with detail tape to ensure watertight installation.

D. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

E. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

F. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing or vapor retarders.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet membrane and firmly secure with detail tape.

H. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 MOLDED DRAINAGE COMPOSITE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextlle facing away from wall from earth substrate, according to manufacturer's written instructions. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.05 FIELD QUALITY CONTRIOL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Project representative.

3.06 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where drainage panels will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Building thermal insulation and accessories, including but not limited to the following:

1. Thermal batt insulation between wall framing at exterior walls
2. Rigid perimeter insulation at foundation walls
3. Batt insulation in exterior wall and ceiling construction.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry: Sill Sealer
2. Section 06 12 00 – Structural Insulated Panels: Insulating sheathing
3. Section 07 44 00 – Concrete Faced Panels: Foundation insulation
4. Section 07 54 00 – Thermoplastic Membrane Roofing: Roofing insulation for TPO roofing
5. Section 09 29 00 – Gypsum Board: Sound attenuation insulation.
6. Division 23, Mechanical: Insulation for ducts, heating, air conditioning, ventilating, and plumbing work shall be furnished and installed by the respective Mechanical Contractor.

1.02 ACTION SUBMITTALS

A. Prepare submittals in accordance with Section 01 33 00 – Submittal Procedures.

1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish each insulation type from one manufacturer for entire Project, unless otherwise acceptable to Architect.

B. Insulation Thermal Properties: Thermal resistance R-values indicated are values at 75 degree mean temperature. Where insulation is identified by R-value, provide thickness required to achieve indicated R-value. Foam plastic insulation R-values are “aged” thermal values in accordance with RIC/TIMA conditioning procedure.

C. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products in accordance with test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

D. Foam plastic insulation: Foam plastic insulation cores, coatings and facings shall meet the following classification requirements when tested in accordance with ASTM E84.

1. Exterior walls: Flame spread rating of 25 or less; smoke developed rating of 450 or less.

1.04 DELIVERY, STORAGE AND HANDLING

A. Insulation shall be legibly marked with the following data:

1. Its "R" value per inch and the mean test temperature
2. The manufacturer's name
3. The insulation type and its tradename
4. Water vapor transmission (perm inch average)
5. UL rating – flame spread, fuel contribution, smoke developed (ASTM E84 and D1692)

B. Deliver insulation materials in manufacturer's original, unopened, and labeled packages.

C. Provide adequate protection for all materials stored on site and after installation. Protect insulation from physical damage, and from becoming wet and soiled.

D. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Rigid insulation board (extruded polystyrene):

a. DuPont de Nemours, Midland, MI.
b. Owens-Corning Co., Parsippany, NJ.
c. Kingspan Insulation NA, Atlanta, GA

2. Glass Fiber Batt Insulation:

a. CertainTeed Corp., Valley Forge, PA
b. Owens-Corning, Toledo, OH
c. Knauf Insulation, Shelbyville, IN
d. Johns Manville, Denver, CO

3. Low pressure polyurethane foamed-in-place insulation / air barrier sealant:

a. Fomo Products, Inc., Norton OH.
b. Dupont, Midland, MI.
c. Convenience Products, Division of Clayton Corp., Fenton MO.
d. Henry Company, El Sequndo CA.

2.02 INSULATION MATERIALS

A. Fiberglass Batt/Blanket Insulation: Glass or other inorganic fibers and resinous binders formed into flexible batts or blankets.

1. Unfaced Glass Fiber Insulation (typically in exterior walls and ceilings as indicated on drawings):

a. ASTM C665,Type I, preformed formaldehyde free glass fiber batt type, passing ASTM E136 for combustion characteristics.

2. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

a. 3-1/2 inches thick with a thermal resistance (R-value) of 11.
b. 5-1/2 inches thick with a thermal resistance (R-value) of 19.

3. Fire Rating: ASTM E84, Flame spread 25 or less and smoke development 50 or less.
4. Non-combustible: classified non-combustible per ASTM E136 at 750^{o}C
5. Acceptable Manufacturers:

a. Commercial Blanket Insulation, CertainTeed Corp.
b. Unfaced Commercial Insulation, Johns Manville.
c. PINK NextGen Fiberglas Insulation, Owens Corning.

B. Foundation Perimeter Board Insulation: Rigid closed-cell, extruded polystyrene thermal board insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C578 for type and with other requirements indicated below:

1. Thermal Resistivity: Not less than 5 per inch ft^2 x h x ^{o}F/Btu x in. 75 deg F mean temp.

2. Thickness or Thermal Resistance (R-Values): As scheduled; value determined at not less than 6 months after manufacture.
    a. Where insulation is indicated by the following thicknesses, provide boards with thermal resistances indicated:
        1) 2 inches thick with a thermal resistance (R-value) of 10.
        2) 3 inches thick with a thermal resistance (R-value) of 15.
3. Classification: ASTM C578, Type IV, density of 1.45 lb/cu ft. minimum density.
4. Fire Rating: Surface-burning characteristics: Maximum flame spread and smoke-developed indices of 15 and 175, respectively.
5. Acceptable Manufacturers:
    a. Basis of Design: DuPont Styrofoam Brand Scoreboard
    b. Kingspan GreenGuard.
    c. Owens Corning Foamular.

C. Foam-In-Place Insulation:

1. Polyurethane Foam Insulation (Minimal Expansive) for Window and Door Perimeters: Single or two-component, UL classified sealant, to insulate, seal, fill, and stop air infiltration; shall not expand to the point to cause pressure on window and door jambs.
    a. Density: ASTM D 1622, 1.0 - 1.8 lbs./cu. ft.
    b. R-Value: ASTM C 518, not less than 4.0 per inch of thickness.
    c. Fire-Test-Response Characteristics: ASTM E 84, as follows:
        1) Flame Spread: Not greater than 25.
        2) Smoke Developed: Not greater than 50.
    d. Acceptable Manufacturers and Products:
        1) Dow Chemical Company (The); Great Stuff PRO Window & Door.
        2) Fomo Products Inc.; Handi-Seal Window and Door Sealant.
        3) Convenience Products; No-Warp Foam Window & Door Insulating Sealant.

2.03 AUXILIARY INSULATING MATERIALS

A. Rigid Board Adhesives: Provide insulation manufacturer's recommended adhesives for sealing joints and bonding insulation to substrates shown. Adhesives shall be compatible with insulation materials secured.

B. Tape: Self-adhering pressure sensitive, compatible with insulation, foil type recommended by manufacturer of insulation.

C. Supplementary Support: Galvanized steel hexagonal wire mesh where required for supplementary support of insulation in permanent proper location. Provide manufacturer's recommended fasteners.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare surfaces and areas to receive insulation material as required by the manufacturer. Do not install materials in unsatisfactory areas or to improperly prepared surfaces.

B. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

C. Verify substrate and conditions under which insulation work is to be performed. Do not proceed with installation until unsatisfactory conditions have been corrected.

D. Verify substrate surface is clean, flat, dry, free of irregularities, and ready to receive insulation materials.

E. Verify insulation boards are dry, unbroken, and free of damage.

3.03 INSTALLATION – GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.04 INSTALLATION – RIGID BOARD INSULATION

A. Foundation Insulation: Install board insulation on foundation perimeter with adhesive in accordance with manufacturer's instructions.

1. Stagger board joints.
2. Butt edges and ends tight to adjacent board and to protrusions.
3. Extend boards over expansion joints, unbonded on one side of joint.

B. Cavity Wall Insulation: Install board insulation horizontally beginning at bottom of cavity.

1. Secure insulation with adhesive.
2. Stagger joints between courses.
3. Place boards in method to maximize contact bedding.
4. Butt edges and ends tight to adjacent board and to protrusions.
5. Cut and shape insulation with knife, handsaw, or other cutting tool as required to fit around penetrations, projections, and openings to accommodate conduit or other services.
6. Seal cut-outs with manufacturer's recommended sealant.

C. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. Bond with adhesive to vertical substrate. Stagger all joints. Butt edges and ends tight to adjacent board with no protrusions.
2. Protect insulation from displacement and damage during backfilling and slab placement.

D. Install boards on exterior walls vertically and hold in place with Z-furring channels spaced at maximum 24 inches on center.

1. Install panels and furring channels progressively starting at corner condition. Space furring channels not more than 12 inches from corner at interior corners and not more than 3 inches from corner at exterior corners.
2. Install insulation full height of wall. Stagger horizontal joints. Cut insulation to fit non-standard spaces. Bond with adhesive to vertical substrate.

3.05 INSTALLATION – BATT AND BLANKET INSULATION

A. Provide batt insulation where indicated and where the insulation is not part of another Specification Section. Install insulation after plumbing, mechanical, and electrical services have been installed.

B. Install fiberglass blankets/batts in cavities formed by framing members according to the following requirements:

1. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends. Use batts free of damage and stagger butt joints.
2. Place blankets/batts in cavities formed by members to produce a friction fit between edges of insulation and adjoining framing members.
3. Provide mechanical fasteners, wire mesh, or other accessories to ensure insulation remains in specified position.

4. Fit insulation tight within spaces and tight to exterior side of plumbing, mechanical, and electric services within plane of insulation leaving no gaps or voids.
5. Cut and fit tightly around all obstructions and fill all voids around all cutouts for lights, cabinets, pipes and plumbing, HVAC ducts, electrical boxes, and other irregularities. Provide 3 inch clearance around non-IC recessed light fixtures unless lighting fixtures are rated for contact with insulation.
6. Install insulation within metal framing systems full height and width. Do not allow voids or openings to occur. Insulation is required for full width between studs, including cavity of each stud.
7. Cut insulation oversize to ensure tight butt joints when installed. Cut insulation to fit around protrusions and irregularly shaped projections.
8. For metal-framed wall cavities where cavity heights exceed 96 inches, and the insulation does not completely fill the cavity, support unfaced blankets mechanically and support faced blankets either mechanically or by taping flanges of insulation to flanges of metal studs.

C. Stuff glass fiber loose fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.06 FOAM INSULATION

A. Spray-Applied Foam Insulation: Apply spray-on insulation by certified applicators with pneumatic spray equipment, filling voids, cracks, and holes.

1. Fill spaces between multiple studs inaccessible to batt insulation.
2. Use in locations concealed by gypsum board only. Do not use in exposed locations.

3.07 PROTECTION

A. Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible non-delayed installation of concealing work, or where that is not possible, by temporary covering or enclosure.

B. Seal all cuts, punctures and penetration of integral insulation vapor barriers with vapor barrier tape before installing surface finishes.

END OF SECTION

SECTION 07 26 16

BELOW GRADE VAPOR RETARDERS

PART 1 – GENERAL

1.01 SUMMARY

A. Section included providing sheet membrane vapor retarders under concrete slabs-on-grade including all accessory items.

B. Related Sections:

1. Section 03 30 00 – Cast-In-Place Concrete
2. Section 31 00 00 – Earthwork

1.02 REFERENCES

A. ASTM International:

1. ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
2. ASTM E1643: Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):

1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
2. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 30 00 – Submittal Procedures.

B. Information and Review Submittals:

1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
2. Manufacturer’s Instructions: Manufacturer’s installation instructions for placement, seaming and pipe boot installation.

C. Quality control/assurance submittals:

1. Summary of test results per paragraph 9.3 of ASTM E1745.
2. Manufacturer’s samples and literature.
3. Manufacturer’s installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

1.04 DELIVERY, STORAGE AND HANDLING

A. Take precautions to prevent puncturing, tearing and damage to vapor retarder.

1.05 COORDINATION

A. Section 31 00 00 for compacted subgrade under vapor retarder, fully compacted and complete.

B. Section 03 30 00 – Cast-in-Place Concrete

C. Division 22 and Division 26 for penetrations through vapor retarder.

1. Penetrations through the vapor retarder shall be coordinated and sequenced to allow proper flashing and sealing of all penetrations prior to placement of concrete.
2. Penetrations through the vapor retarder shall be flashed and sealed prior to placement of concrete.
3. Utility penetrations through the vapor retarder shall be a minimum of 12-inches apart.

1.06 WARRANTY

A. Warranty: Compliance with the designated ASTM E1745 classification, and no manufacturing defects in the product for, at least, the life of the building.

PART 2 – PRODUCTS

2.01 UNDER SLAB VAPOR RETARDERS

A. Basis of Design manufacturer and product:

1. Specified Product (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on Stego Industries LLC company, San Clemente, CA.
2. Product: “Stego Wrap Vapor Barrier (15 mil)”.

B. Acceptable manufacturers and products:

1. Fortifiber, El Segundo, CA
   a. Product: ““Moistop Ultra 15”
2. Reef Industries, Houston, TX,
   a. Product “Griffolyn -15 Mil Green”.
3. Layfield, Chicago, IL
   a. Product: VaporFlex

C. Performance requirements:

1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 /hr/inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Minimum thickness: 15 mils.
3. Water Vapor Permeance ASTM F1249 – Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor: 0.0086 perms.
4. Tensile Strength ASTM D882 – Test Method for Tensile Properties of Thin Plastic Sheeting: 70.6 lbf/in
5. Puncture Resistance ASTM D1709 – Test Method for Impact Resistance of Plastic Film by Free-Falling Dart Method: 2,266 grams

2.02 ACCESSORIES

A. General: Tapes, adhesives and fasteners required for the proper and complete installation for work of this Section shall be as recommended by each respective manufacturers of each type of vapor barrier.

B. Pressure Sensitive Tape, Seam Splice Tape Primer, Boots, and Other Accessories: As instructed by manufacturer for watertight impermeable underslab retarder.

C. Perimeter edge seal: Termination bar or recommended sealing tack tape by vapor retarder manufacturer.

D. Vapor barrier safe concrete accessories by vapor retarder manufacturer.

1. Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section.

1. Underslab Utilities: Drain lines and utilities properly installed and ready for work of this Section.
2. Through-Slab Penetrations: Ready for work of this Section.

B. Verify subgrade is compacted, smooth, level and free from conditions that may cause puncture or other damage to vapor retarder.

3.02 PREPARATION

A. At slabs on grade, rake and level irregular subgrades within a tolerance of 1/2 inch and then re- recompact.

3.03 INSTALLATION – BELOW-SLAB VAPOR RETARDERS

A. General: Install Vapor Barrier in accordance with manufacturer's instructions and ASTM E 1643. Place vapor barrier beneath all floor slabs. Install vapor retarder sheet over compacted capillary break material.

B. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour and with minimum number of joints.

C. Lap vapor retarder over footings, turn up to full slab thickness, and seal with pressure sensitive tape to foundation walls.

D. Overlap joints a minimum of six inches with top lap in direction of spreading concrete. Turn up double layer at slab edges abutting walls. Seal with manufacturer's tape.

E. Seal pipe penetrations (including pipes, reinforcing steel, and permanent utilities) with vapor retarder or prefabricated boots and pressure sensitive tape. Field fabricate boots and other shapes as necessary to seal vapor retarder against vapor penetration.

F. Do not puncture vapor barrier. No punctures or unsealed penetrations are permitted.

G. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

H. Place concrete slab-on-grade directly over installed vapor retarder under work of Section 03 30 00. Do not install granular fill layer over vapor retarder.

3.04 FIELD QUALITY CONTROL

A. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.

B. Inspect competed installation prior to placing concrete slab-on-grade.

C. Verify vapor retarder installed in accordance with manufacturer's instructions with penetrations taped and sealed.

D. Verify that vapor retarder has not been penetrated by screed stakes and that base set screed posts are in place.

3.05 ADJUSTMENTS

A. Patch penetrations with pressure sensitive tape and make adjustments as necessary to maintain performance of vapor retarder as instructed by manufacturer.

B. Repair damaged areas by cutting vapor retarder patches. Overlap tears and holes 6 inch beyond damaged area with patches. Seal patch to installed vapor retarder with pressure sensitive tape or as instructed by manufacturer.

C. Promptly patch tears and punctures as they occur. Do not patch or seam when vapor retarder is wet.

3.06 PROTECTION

A. Protect From Penetration: Do not permit use of ground set stakes, screed posts, and other items to puncture vapor retarder. Where punctured, remove penetrating item and patch vapor retarder, as specified this Section, before placing concrete.

B. Lay plywood or other protection board over installed vapor retarder at areas of heavy traffic and other construction loads. Do not stack construction materials directly on vapor retarder.

END OF SECTION

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIER

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes a system of fluid applied coatings to stop passage of air through exterior walls, joints between exterior walls and roof, joints at foundation connections, and joints around frames of openings in exterior walls.

B. Materials and installation to bridge and seal the following leak pathways and gaps:

1. Connections of the walls to the roof weather barrier
2. Connections of the walls to the foundations
3. Openings and penetrations of window frames, door frames, store front, curtain wall
4. Termination at existing construction and at neighboring wall assemblies
5. Door frames, piping, conduit, duct and similar penetrations
6. All other air leakage pathways through the walls

C. Related Sections include the following:

1. Section 06 16 00 – Sheathing.
2. Section 07 62 00 – Sheet Metal Flashing
3. Section 07 92 00 – Joint Sealants: Joint-sealant materials and installation

1.02 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air and acts as a waterproof weather-resistive barrier.

B. Air-Barrier Accessory: A transitional component of the weather barrier that provides continuity.

C. Air Barrier Assembly: The collection of weather barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

D. Air Barrier System: The sum of weather barrier assemblies that comprise a building envelope's walls, roof, and ground separation installed to control air movement through the building envelope.

1.03 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable weather barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air Barrier Assembly Air Leakage: Not to exceed 0.01 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.05 L/s x sq. m of surface area at 75 Pa); ASTM E 2357.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of weather barrier.

C. Shop Drawings: Show locations and extent of weather barriers. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining systems, and other termination conditions. Provide details at a minimum 6”=1’-0” scale.

1. Include details of interfaces with other materials that form part of weather barrier, and waterproofing system for each type of exterior wall system, including but not limited to:

a. Details of each roof edge condition and roof to wall conditions where the weather barrier interfaces with the roofing system.
b. Details of each exterior wall footing condition.
c. Details at the edge of slab and other locations where the deflection, control joints and expansion joints are required.
d. Details at typical mechanical and electrical penetrations.
e. Details at typical window, curtainwall, door frame and louver openings.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates: For weather barriers, certifying compatibility of weather barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

B. Compatibility Statement:

1. Waterproofing and weather barrier System: Provide written documentation from manufacturers of each specified system indicating that all components are compatible with one another.

C. Qualification Data: For Applicator.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for weather barriers.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying weather barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain product and accessories from single manufacturer.

C. Weather barrier/ Waterproofing Mockups: Before beginning installation of weather barrier, provide all waterproofing and weather barrier materials for and construct mockups of exterior wall assembly(s) shown on Drawings, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of weather barrier membrane.

1. Coordinate the Work of this Section for the mock-ups with the Work of other trades to provide a complete mock-up of exterior envelope components.
2. Schedule construction of mockup to permit inspection by Owner's testing agency of weather barrier before external insulation and cladding is installed.
3. Include junction with roofing membrane, building corner condition, window jamb, sill & head conditions, rectangular mechanical penetrations, round electrical or plumbing piping penetration, deflection joint condition, foundation wall intersection and other condition shown on the drawings or requested by the Architect.
4. Mock-up may be done as part of the Wall Panel Mock-up(s) in configuration shown on the drawings.
5. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply weather barrier until mockups are approved.
6. Do not apply weather barrier, waterproofing and sheathing materials to the mock-up until the Pre-Installation Conference, described in this section, has commenced.

D. Preinstallation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to weather barrier, including roofing, waterproofing, concrete, sealants, windows, glazed curtain walls, and door frames.
2. Schedule conference after weather barrier product data & shop drawing submittals have been approved and before weather barrier, waterproofing and sheathing materials have been applied to the required Mockup(s).
3. Review weather barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by weather barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Apply weather barrier within the range of ambient and substrate temperatures recommended by weather barrier manufacturer. Protect substrates from environmental conditions that affect performance of weather barrier. Do not apply weather barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.09 WARRANTY

A. Special Manufacturer’s Warranty: Manufacturer’s standard form in which manufacturer agrees to replace weather barrier material that does not comply with requirements or fails to for specified barrier within specified warranty period.

1. Warranty does not include failure of weather barrier membrane due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Two years from the date of Substantial Completion.

B. Special Installer’s Warranty: Standard form, signed by Installer, covering Work of this Section for a warranty period of two years.

1. Warranty includes removing and reinstalling cladding, finish panels, and overburden on surfaces the weather barrier is installed upon.

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Supply primary air-barrier materials and air-barrier accessories from single manufacturer.

2.02 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric synthetic polymer membrane.

1. Basis of Design: Carlisle Coatings and Waterproofing: Barriseal, 40 mils thick (dry)
2. Acceptable Products: Subject to compliance with requirements, provide basis of design or one of the following.
    a. GCP Applied Technologies: Perm-A-Barrier Liquid, 60 mils thick (wet)
    b. Holmann & Barnard, Inc: Enviro-Barrier Liquid Air and Vapor Barrier, 60 mils (wet), 40 mils (dry)
    c. Tremco, Inc.: ExoAir 120 SP (Spray Grade) or ExoAir 120 R (Roller Grade), 60 mils (wet), 40 mils (dry)
3. Physical and Performance Properties: (Barriseal)
    a. Air Permeance: 0.009 L/s*m2 , ASTM E2178, Mod Barriseal-S at minimum 40 mils cured on CMU.
    b. Water Vapor Permeance: 0.02 perms; ASTM E 96/E 96M.
    c. Ultimate Elongation: Minimum 1000 percent; ASTM D 412, Die C.
    d. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Detail Flashing: 40 mil thickness, self-adhering flashing consisting of 4 mil cross-laminated HDPE facer laminated with 36 mils SBS-modified asphalt adhesive.

1. CCW-705 by Carlisle Coatings & Waterproofing, Inc.
2. Others as specified by weather barrier manufacturer.

C. Liquid Flashing: Minimum 40 mil wet thickness application of minimum 80% solids, silane-terminated polymer (STPE), moisture curing elastomer.

1. Barribond by Carlisle Coatings & Waterproofing, Inc.
2. Others as specified by weather barrier manufacturer.

D. Window Transition Sheet: Membrane for sealing window, door, curtain wall or other fenestration frame to weather barrier on opaque wall. Use with manufacturer's recommended accessory items.

1. SURE-SEAL Pressure-Sensitive Elastoform by Carlisle Coatings & Waterproofing, Inc.
2. Silicone sheet by others, as approved by weather barrier manufacturer.

2.03 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by weather barrier manufacturer for intended use and compatible with weather barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Reinforcing Fabric: Woven synthetic fabric. Fabric saturated in product shall be able to cover un-filled gaps up to ¼ inch width.

1. DCH Reinforcing Fabric by Carlisle Coatings & Waterproofing, Inc.
2. Others as specified by weather barrier manufacturer

C. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

D. Joint Sealant: Comply with Section 07 92 00.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by weather barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate per manufacturer instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by weather barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.

E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

F. Concrete: Prepare, treat, rout, and fill open joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer recommendations. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

G. Sheathing: Boards shall be flush at joints, with gaps between boards according to building code and sheathing manufacturer's requirements. Sheathing boards shall also be securely fastened to the structure with proper fastener type, technique and spacing according to building code and sheathing manufacturer's requirements.

1. Sheathing boards shall be repaired or replaced if inspection reveals moisture damage, mechanical damage or if sheathing boards have exceeded the exposure duration or exposure conditions as required by the sheathing manufacturer.

H. Cover gaps in substrate plane and form smooth transitions from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for weather barrier membrane.

1. Contractor Option: Self-adhesive stainless steel flashing.

I. Bridge isolation joints, deflection joints, expansion joints, and discontinuous wall-to-wall, deck- to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer recommendations and details.

3.03 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer recommendations and details to form air- and water-tight seals with adjacent construction for continuity of air and water barrier.

1. Coordinate the installation of weather barrier with installation of roofing membrane and base flashing to ensure continuity of weather barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that minimum 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal air-barrier membrane continuously to roofing-membrane weather barrier, foundations including penetrations, concrete below-grade structures, wall to roof construction, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, wall openings, and other leakage pathways in the building envelope.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that minimum 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to ensure adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with closed-cell foam sealant.

G. Seal top of through-wall flashings to weather barrier with an additional 6-inch-wide, transition strip.

H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.04 WEATHER BARRIER MEMBRANE INSTALLATION

A. Apply weather barrier membrane to form a seal with strips and transition strips and to achieve a continuous weather barrier according to weather barrier manufacturer's written instructions.

B. Apply weather barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates, where recommended by manufacturer, at required rate and allow to dry. Limit priming to areas that will be covered by weather barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
2. Apply primer to all areas to receive transition sheet and / or through-wall flashing membrane, as indicated on drawings by roller or spray and allow minimum 30 minute open time.

D. Transition Sheet:

1. Position self-adhered transition membrane and remove protective film. Press firmly into place. Ensure minimum 2" overlap at all end and side laps.
2. Promptly roll all laps with a counter top roller to effect seal.

E. Through-wall Flashing Membrane (Self-Adhering Type)

1. Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or self angles, partially remove protective film and roll membrane over surface and up vertically.
2. Press firmly into place. Ensure minimum 2” overlap at all end and side laps.
3. Promptly roll all laps and membrane to effect the seal.
4. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior wall finish.
5. Apply through-wall flashing membrane along the base of veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 8-inches up the back-up wall.

F. Apply a continuous unbroken weather barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions.

1. Vapor-Permeable Membrane Air Barrier: 40-mil dry film thickness.

G. Apply strip and transition strip a minimum of 1 inch onto cured air membrane or strip and transition strip over cured air membrane overlapping 3 inches onto each surface according to weather barrier manufacturer's written instructions.

H. Do not cover weather barrier until it has been tested and inspected by Owner's testing agency substrates and reapply weather barrier components.

3.05 FIELD QUALITY CONTROL

A. Notify Owner’s inspection agency/ABAA auditor in writing of schedule for Work of this Section to allow sufficient time for inspections. Contractor shall not cover Work of this Section until testing and inspection is accepted.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Owner’s Inspection and Testing/ABAA audits: Contractor shall cooperate with Owner’s inspection/testing agency and ABAA auditors. Allow access to work areas and staging.

D. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of weather barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of weather barrier system has been provided.

3. Concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

E. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed weather barrier or part thereof.

F. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer recommendations, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

G. Repair damage to weather barriers caused by testing; follow manufacturer recommendations.

H. Prepare test and inspection reports.

3.06 CLEANING AND PROTECTION

A. Protect weather barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace weather barrier exposed for more than 30 days.
2. Protect weather barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by weather barrier manufacturer

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION

SECTION 07 31 26

SLATE SHINGLES

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes re-laying salvaged slate shingles on a new roof substrate and the following:

1. Self-adhering high temperature underlayment
2. Snow guards
3. Accessories required for installation

B. Related Section:

1. Section 06 10 00 – Rough Carpentry for wood nailers, cants and plywood roof sheathing
2. Section 07 62 00 – Sheet Metal Flashing

C. Allowances: Refer to Section 01 23 00 – Allowances for work of this section affected by allowances.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 30 00 – Submittal Procedures.

B. Replacement Slate for Verification: Full-size units for each type of slate shingle indicated; in sets for each color, texture, shape, and size specified, showing the full range of variations expected. Prepare samples from the same material to be used for the Work.

1.03 QUALITY ASSURANCE

A. Protection of Site and Historic Properties:

1. All work shall be performed in accordance with the “Secretary of the Interior’s Standards for Rehabilitation, “U.S. Department of the Interior, National Park Service, 1995.” They can be found at http://www.nps.gov/hps/tps/standguide/rehab/rehab_standards.htm

B. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with the Architect, Owner’s insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

C. Source Limitations for Slate: Obtain each variety of slate from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. Review existing slate roof conditions and submit a proposed work plan, coordinated with the Contractor’s Construction Schedule. Describe in detail the materials, methods, equipment, and sequence of operations to be used for each part of the shingle restoration work.

E. Slaters shall be experienced workmen, having at least five years experience in slate roof work with at least one job involving repair/replacement work on buildings in this area.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver slate shingles to Project site and store as close as possible to the point of installation to minimize damage while handling.

B. Store and handle roofing materials to prevent breakage and ensure dryness. Store in a dry, well-ventilated, weathertight place. Store rolls of felt and other sheet materials on end on pallets or another raised surface.

C. Do not leave unused felts on roof overnight or when roofing work is not in progress unless protected from weather or other moisture sources.

D. Handle and store materials and equipment in a manner to avoid significant or permanent deflection of deck.

1.05 PROJECT CONDITIONS

A. In addition to normal roofing procedure, observe the following:

1. Roofers shall wear rubber soled shoes and safety lines at all times while on roof.
2. Do not walk on slate surfaces.
3. Use self-supporting ladders and scaffolds.
4. Store slate to avoid cracking, crushing or other damage to material.

PART 2 – PRODUCTS

2.01 SHINGLES

A. Slate Shingles: Hard, dense, sound rock, machine punched or drilled for two nails located for proper head lap or if attached otherwise, furnish like original slate. No broken or cracked slates, no broken exposed corners, and no broken corners on covered ends that could sacrifice nailing strength or laying of a watertight roof. No ribbons in exposed portion of shingle, and curvature not to exceed 1/8 inch per 12 inches.

1. Classification: ASTM C 406.
    a. Grade S1 or S2: Expected service life of Grade S1 or upper limits of Grade S2.
2. Thickness: Nominal 3/16 inch.
3. Length and Width: Existing slate.
4. Color: Existing building slate.

2.02 SHEET METAL FLASHING

A. Copper: ASTM B 370; temper H00, cold rolled except where temper 060 is required for forming; not less than 16 oz./sq. ft., unless otherwise indicated.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

B. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.

1. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
2. Products: Subject to compliance with requirements, provide one of the following:
    a. Dimensional Metals; DynaClad® Ultra HT Wind & Water Seal™
    b. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    c. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.

d. Henry Company; Blueskin PE200 HT.
e. IMETCO; Aqua block.
f. Owens Corning; WeatherLock Metal High Temperature Underlayment.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.04 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 07 62 00 – Sheet Metal Flashing and Trim.

B. Fabricate sheet metal flashing and trim to comply with recommendations that apply to design, dimensions, metal, and other characteristics of the item in SMACNA's "Architectural Sheet Metal Manual."

2.05 SNOW GUARDS

A. Manufacturer: Berger Metal Products

B. Components:

1. Mullane #200S-NA Snow Guard Assembly consists of individual cast snow guard shoe with copper strap assembly.
2. Fasteners: Metal compatible with snow guards.

C. Shoe: Cast Bronze (C84400, ASTM A47), Strap: 24 oz. cold rolled copper (7.3 kg/m2); Rivet: copper.

D. Finish: Mill finish

2.06 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied.

C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in slate-shingle roofing and remain watertight.

D. Slating Nails: ASTM F 1667, copper, ring shanked, wire nails; 0.135-inch minimum thickness; sharp pointed; with 3/8-inch-minimum diameter flat head; of sufficient length to penetrate a minimum of 3/4 inch into sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

E. Slate Hooks: Stainless steel hooks, specially manufactured for replacement slate installation.

F. Wood Nailers and Beveled Cant Strips: Comply with requirements for pressure-preservative-treated wood in Section 06 10 00 – Rough Carpentry.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provision has been made for flashings and penetrations through roofing.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION AND REPAIR OF EXISTING ROOF DECK

A. Remove damaged and cracked slate shingles. Salvage slate shingles which are without chips, cracks, or other damage for reuse.

B. Remove areas of roof deck which have deteriorated and are not suitable for support and attachment of slate shingles. Inspect framing below removed decking and report any deteriorated framing to Architect.

C. Do not apply underlayment or shingles over wet roof decking.

D. Reapply slate shingle work as soon as practicable after installation of the replacement wood deck. Do not use the permanent building felts as temporary roofing, uncovered or unprotected during inclement weather or overnight. Provide temporary polyethylene sheet, or other type, protective coverings over all exposed portions of the roof deck if the slate shingle work is not applied immediately after installation of sheathing, in manner to assure positive weather protection.

3.03 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing to the extent indicated on drawings. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

C. Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 – "Sheet Metal Flashing.

3.04 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 – Sheet Metal Flashing and Trim.

B. Install metal flashings according to concrete roof tile manufacturer's written instructions and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual." a. Install step flashing prior to shingles.

3.05 SLATE SHINGLE INSTALLATION

A. General: Beginning at eaves, install slate shingles according to manufacturer's written instructions and to details and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

1. Install wood nailer strip cant at eave edges.
2. 2. Install shingle starter course chamfered face down.

B. Install first and succeeding shingle courses with chamfered face up. Install full-width first course at rake edge.

1. Offset joints of uniform-width slate shingles by half the shingle width in succeeding courses.
2. Offset joints of random-width slate shingles a minimum of 3 inches (75 mm) in succeeding courses.

C. Slates which overlap metal flashings should be nailed in such a manner as to avoid puncturing the metal. Punch second hole about 2 inches above the existing hole on the side of the slate not overlapping the metal flashing. Punched from the back side of the slate.

D. Slate Shingle Installation: Install slate shingles according to written recommendations of NRCA's "Steep Roofing Manual." Unless otherwise indicated, provide at least a 3-inch head lap between succeeding courses of slate shingles and break (stagger) joints between courses a minimum of 3 inches. Provide a 2-inch projection of slate at eaves and 1-inch projection at gables. Cut and fit slate neatly around roof vents, pipes, ventilators, and other projections through roof.

1. Attach slate shingles using method to match existing construction attachment method.
2. Cut, punch, drill, modify new shingles as required to fit new metal work.
3. Cover all exposed nail heads with elastic cement. Hip, slates and ridge slates shall be laid in elastic cement spread thickly over unexposed surface of under courses of slate, nailed securely in place

and carefully pointed with elastic cement. Slate shingles at eave shall be doubled at first exposed course.

4. Install slate at ridges and hips in saddle pattern. Lay ridge and hip slates in plastic cement spread generously over unexposed surfaces of lower course of slate. Attach ridge slates in place. Attach hip slates to supporting wood blocking. Align butts of combing slates at hips with butts of coursed shingles. Cover heads of exposed fasteners with plastic cement.
5. Install ridge and hip covers according to manufacturer's written instructions.
6. Cut slate at valleys to form open valleys with a straight border. Taper valleys from a 2 inch exposure of metal flashing on each side of valley at top and increase exposure by 1 inch (each side) per 96 inches of valley length.
7. Slates overlapping sheet metal work shall have the nails so placed as to avoid puncturing the sheet metal. Exposed nails shall be permissible only in top courses where unavoidable.

3.06 SNOW GUARD INSTALLATION

A. Comply with architectural drawings and snow guard manufacturer's recommendations for location of system. Comply with manufacturer's written installation instructions for installation and layout.

3.07 ADJUSTING AND CLEANING

A. Remove and replace damaged or broken slates.

B. Remove excess slate and debris from Project site.

END OF SECTION

SECTION 07 41 13

MANUFACTURED ROOF PANELS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes pre-finished, factory-formed architectural steel standing seam roofing system, associated flashings and accessories for a complete weathertight roofing system. Roofing systems includes:

1. Prefabricated roof panels
2. Flashings and trim
3. Ridge vent
4. Snow guards

B. Related Sections:

1. Section 07 71 00 – Roof Specialties: Gutters and downspouts
2. Section 07 92 00 – Joint Sealants for field-applied sheet metal roofing sealants.

1.02 REFERENCES

A. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1. SMACNA Architectural Sheet Metal Manual.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
2. Product Data for Recycled Content: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
3. Product Test Reports SRI: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.
4. Product Data for Regional Materials: List of proposed regionally manufactured materials and regionally extracted, harvested, or recovered materials. Identify each regionally manufactured material, its source, and cost.

C. Shop Drawings:

1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the architect (owner) for shop or erection drawings.
2. Submit small-scale layouts of panels on roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, snow guards and special details. Furnish roof plans, elevations, and methods of erection.
3. Submit layouts of panels including details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, ridge vent, closures, and special details. Submit similar details of roof drainage system.
4. Drawings shall include material type, metal thickness, finish, method of fabrication, method of installation method of anchorage to accommodate thermal movement, and sealant data.
5. Include roof plans showing location and attachment details of rail-type snow guards.
6. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacing, and finish.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of the following products certifying that the products furnished comply with requirements:

1. Sheet metal roofing.
2. Special finishes.

B. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Sample Warranties: For special warranties.

D. Maintenance Data: For metal panels to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage a manufacturer certified and experienced installer with not less than five years of successful experience and who has completed sheet metal roofing similar in material, design, forming method, and extent to that indicated for this Project, certified or licensed by the manufacturer, and with a record of successful in-service performance.

1. Installer shall be trained and certified by the metal roofing system manufacturer with trained supervisory personnel observing and directing work.
2. Certificate: When requested, submit certificate indicating qualifications.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer’s installation instructions and manufacturer’s warranty requirements. Comply with provisions of Section 01 31 00 – Project Coordination.

C. Industry Standard: Comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown.

D. Field Measurements: Prior to fabrication of metal panels, take field measurements of structure or substrates to receive panel system. Verify panel layout with roof plan and notify Architect of any discrepancies.

E. Manufacturer: Obtain all materials from a single manufacturer. Provide secondary materials as recommended by the manufacturer of primary materials.

1. A representative of the roofing manufacturer shall inspect the progress of the work at critical stages to determine that conditions for installation is progressing in accordance with the manufacturer’s approved procedures.
2. Critical stages are defined as commencement of installation, midway through installation, and at the completion of the installation.
3. Provide copy of roofing system manufacturer’s inspection reports for each of these stages within seven days of the inspection.

1.06 PREINSTALLATION CONFERENCE

A. Meet with Architect, sheet metal roofing Installer and installers whose work interfaces with or affects sheet metal roofing including installers of roof accessories and roof-mounted equipment.

B. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

C. Review methods and procedures related to sheet metal roofing installation.

D. Examine sheathing conditions for compliance with requirements, including flatness and attachment to structural members.

E. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal roofing.

F. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.

G. Review temporary protection requirements for sheet metal roofing during and after roofing installation.

H. Review roof observation and repair procedures after sheet metal roofing installation.

I. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.08 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.09 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 30 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Solar Reflectance Index: Not less than 28 when calculated according to ASTM E 1980.

C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/180 of the span.

D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind- uplift-resistance class indicated.

1. Uplift Rating: UL 90.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.02 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

C. Basis-of-Design Product:

1. The design for sheet metal roofing is based on products of Petersen Aluminum Corp. Acworth, GA.
   a. Petersen Aluminum Corp. “Tite-LocPanel”
2. Subject to compliance with requirements, provide the named basis of design product or a comparable product by one of the following:
   a. Dimensional Metals, Inc., Reynoldsburg, OH, “double lock panel DL15.”
   b. ATAS International Inc., Allentown, PA. “1-1/2 inch Field-Lok.”
3. Comparable system manufacturer shall provide a warrantable standing seam roofing system in accordance with the specification requirements. Nothing specified herein shall supersede the basis of design manufacturers system requirements and specifications. Differences in product or

materials properties between the named “Basis of Design” and other named manufacturers shall be accommodated and provided.

D. Basis-of-Design Product Description: The following establishes the minimum level of quality, performance, dimension, and appearance required.

1. Seam Height: 1.5 inch seam height.
2. Panel Width: 17 inches o.c.
3. Prefinished Material: 24 gauge steel, hot-dipped galvanized; ASTM A446, Grade C G90 coating A525 gauge core steel.
4. Texture: Smooth.
5. Length: Full length of roof slope, without lapped horizontal joints.
6. Rating: UL Classified 90 rated (wind uplift) panel assembly.
7. Fasteners: Manufacturer’s recommended fasteners, compatible with materials being fastened and UL Classified 90 rated.
8. Sealant Bead: Factory-applied sealant bead.

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

B. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.

1. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
2. Products: Subject to compliance with requirements, provide one of the following:

a. Dimensional Metals; DynaClad® Ultra HT Wind & Water Seal™
b. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
c. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.
d. Henry Company; Blueskin PE200 HT.
e. IMETCO; Aqua block.
f. Owens Corning; WeatherLock Metal High Temperature Underlayment.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.04 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Ridge Vent: Provide manufacturers standard continuous ridge vent for ventilation of attic space.

D. Metal Fascia: Standard metal fascia material by metal roofing manufacturer. Products with comparable materials, panel profiles, performance criteria and colors by manufacturers listed are also acceptable.

1. Wrapped formed fascia.
2. Drip edges.
3. Miscellaneous trim and flashings.

4. Concealed Fasteners: Manufacturer's recommended type, size and length required for installation conditions.
5. Color: Match roofing color.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.05 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

2.06 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish: Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

D. Colors: As indicated on the drawings.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, sheet metal roofing supports, and other conditions affecting performance of work.

B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for flashings, and penetrations through sheet metal roofing.

D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

E. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before sheet metal roofing installation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Install flashings and other sheet metal to comply with requirements specified in Section 07 62 00 –- Sheet Metal Flashing.

3.03 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing to the extent indicated on drawings. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 – "Sheet Metal Flashing.

3.04 STANDING SEAM METAL ROOF INSTALLATION

A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

B. Field cutting of sheet metal roofing by torch is not permitted.

C. Rigidly fasten eave end of sheet metal roofing and allow ridge end free movement due to thermal expansion and contraction. Predrill roofing.

D. Flash and seal sheet metal roofing with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.

E. Locate and space fastenings in uniform vertical and horizontal alignment.

F. Install ridge caps as sheet metal roofing work proceeds.

G. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.

H. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.

I. Fasteners: Use fasteners of sizes that will not penetrate completely through substrate.

J. Steel Roofing: Use stainless-steel fasteners.

K. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of dissimilar metals.

L. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

M. Fascia: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.05 FABRICATED SHEET METAL ROOFING INSTALLATION

A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges, unless otherwise indicated.

B. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.

C. Nail cleats not more than 12 inches o.c. Bend tabs over nails.

D. Seal joints as shown and as required for leakproof construction. Provide low-slope transverse seams using cleats where backup of moisture may occur.

E. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

F. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 – Joint Sealants.

G. Provide expansion cleats in roof panels that exceed 30 feet in length.

H. Attach metal pans to substrate with cleats, double- nailed at 12 inches o.c. Install pans reaching from eave to ridge before moving to adjacent pans. Lock each pan to pan below with transverse seam. Before pans are locked, apply continuous bead of sealant to top flange of lower pan. Crimp standing seams by folding over twice so cleat and pan edges are completely engaged.

I. Loose-lock pans at eave edges to continuous cleats and flanges on back edges of gutters.

J. Fold over seams after crimping at ridges and hips.

3.06 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

B. Install components required for a complete sheet metal roofing assembly including trim, ridge vents and closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

D. Coordinate installation with installation of sheathing, sheet metal flashing and trim, metal soffit panels and metal fascia.

E. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to waterproof and weather-resistant performance.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

G. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

H. Pipe and Penetration Flashing: Form flashing around pipe penetration and sheet metal roofing.

I. Fasten and seal to sheet metal roofing as recommended by SMACNA.

J. Install snow guards according to manufacturer's written instructions.

1. Attachment for Standing-Seam Metal Roofing: Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty.

3.07 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.08 FIELD QAULITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements

3.09 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films, if any, as sheet metal roofing is installed. On completion of sheet metal roofing installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

END OF SECTION

SECTION 07 44 00

CONCRETE FACED PANELS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Concrete faced insulated perimeter wall panels

B. Related Requirements:

1. Division 01 - General Requirements: Administrative, procedural, and temporary work requirements.

1.02 REFERENCES

A. ASTM International (ASTM):

1. C518 - Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. C947 - Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber Reinforced Concrete (Using Simple Beam With Third-Point Loading).
3. C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between 30 176C and 30 176C With a Vitreous Silica Dilatometer.
5. D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
6. D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
7. D2394 - Standard Test Methods for Simulated Service Testing of Wood and Wood Base Finish Flooring.
8. D4716 - Standard Test Method for Determining the (In plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
9. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
10. E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
11. CAN/ULC S701 – Standard for Thermal Insulation, Polystyrene Boards
12. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.

1.04 ACTION SUBMITTALS

A. Provide the following submittals in accordance with section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Provide most recent technical components data sheets describing materials physical properties and include product characteristics, performance criteria, physical size and limitations.
2. Provide manufacturers recommended installation methods
3. Provide manufacturers recommended storage and handling requirements and recommendations

C. Manufacturer’s Certificate: Certify that Insulated Concrete Faced Panel form meets or exceed ASTM C578, Type II.

D. Test and Evaluation Report: Submit laboratory test reports certifying that the Insulated Concrete Faced Panel Form is in compliance with NFPA 286.

E. Manufacturers Installation Instructions: Indicate any special instructions.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.05 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store panels off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

B. Store panels flat

C. Do not drop panels

PART 2 – PRODUCTS

2.01 CONCRETE FACED INSULATED SHEATHING

A. Concrete Faced Insulated Perimeter Wall Panels:

1. Basis of Design: WallGUARD Concrete Faced Insulated Perimeter Wall Panels by T. Clear Corporation.

B. Construction:

1. Extruded polystyrene board, ASTM C578, Type IV, rigid, closed cell, with integral high density skin, with integral 5/16 inch thick latex-modified concrete facing.
2. Board Size: 2 x 4 feet x 2-5/16 inches thick.
3. Edges: Tongue-and-groove sides, square ends.
4. thermal resistance: Long term aged R-value of 5 per inch, tested to ASTM C518.
5. Foam compressive strength: Minimum 35 PSI, tested to ASTM D1621.
6. Compressive strength: Minimum 40 PSI, tested to ASTM D 1621.
7. Water absorption: Maximum 0.7 percent by volume, tested ASTM D2842.
8. Water vapor permeance: 0.8, tested to ASTM E96/E96M.
9. Coefficient of lineal thermal Expansion: 3.5 x 10-5 inches per inch x degree F, tested to ASTM D696.

C. Accessories:

1. Metal cap flashing: 24 gage galvanized steel J-channel; 2-1/4 inches wide, 4 inch long leg and 2-1/4 inch short leg; prefinished, color to be selected.

PART 3 – EXECUTION

3.01 INSTALLATION GENERAL

A. Install in accordance with manufacturer’s instructions.

3.02 INSTALLATION - CONCRETE FACED INSULATED PERIMETER WALL PANELS

A. Surfaces to Receive Panels: Flat, sound, clean, and free from irregularities and or jagged surfaces.

B. Lay out panels to maximize board sizes. Do not use boards less than 6 inches wide.

C. Install panels in orientation to maximize full sheets.

D. Install fastening clips and cap flashings

3.03 CLEANUP AND PROTECTION

A. Clean up and properly dispose of all debris remaining on Project site related to the installation of the insulating concrete forms. The materials of an Insulated Concrete Panel are recyclable where available.

END OF SECTION

SECTION 07 46 23

WOOD SIDING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. New exterior wood siding applied over insulating sheathing on barn structure.
2. Related wood trim, accessories, and fastenings.

B. Related Sections:

1. Section 06 16 13 – Insulating Sheathing
2. Section 07 46 46 – Engineered Wood Siding
3. Section 07 62 00 – Sheet Metal Flashing: Metal flashing.
4. Section 07 92 00 – Joint Sealants: Joint fillers.
5. Section 09 91 00 – Painting: Finishing of wood siding and trim.

1.02 REFERENCES

A. West Wood Products Association (WWPA):

1. No. 16, Standard Grading and Dressing Rules for West Coast Lumber

B. Product Standard: PS-20 American Softwood Lumber Standard.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: Indicate materials, sizes, profiles, surface textures, fastening methods, and accessories.

C. Submit Samples:

1. Each type of siding furnished under this section. Samples shall be accurate representations of materials which will be installed in the Work and shall be large enough to show characteristics of the materials which will be visible in the finished work.
2. Each type of proposed fastener.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: None; recommended installer shall have a minimum of two years' experience installing similar materials.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship:

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship and appearance are approved by Architect.
3. Modify mock-up area as required to produce acceptable work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 60 00.

B. Inspect materials upon delivery to assure that specified products have been received. Keep damaged material identified as damaged and removed from the site.

C. Wood materials shall be allowed to acclimate to the site prior to work under this section. Wood materials shall be stored, stickered, and under cover at the site for a minimum of seven days prior to priming, finishing and installation.

D. Protect finish Carpentry during transit, delivery, storage and handling to prevent damage, soiling, and deterioration. Wood shall be delivered on a tarped flatbed truck or an enclosed van for small quantities. Keep wood tarped or store indoors until installation.

E. Store materials in a safe area, away from construction traffic; store under cover and off ground, protected from moisture.

1. Store off the ground, under cover, and well ventilated. Protect from dirt, dampness, and damage.
2. Store to avoid twisting, bending, abrasion and other permanent damage.

F. Avoid contact with materials causing discoloration, staining or other damage.

PART 2 – PRODUCTS

2.01 NEW WOOD SIDING

A. Wood Species: White Pine.

B. Moisture content/stability: Air dried

C. Standard Configurations: Board-to-Board Configuration

1. Lumber Thickness: 7/8 inch
2. Size: 1 x 10 shiplap.
3. Edges: shiplap
4. Texture: Circular sawn, single sided.

D. Wood Trim: White Pine; S1S2E, except provide S4S, in accordance with PS-20, at locations where 2 sides (not including edges) are exposed in the finished work; kiln dried; A Grade or Better; smooth; sizes as indicated on Drawings.

2.02 ACCESSORIES

A. Nails: Hot dipped galvanized, stainless steel, or aluminum siding nails; blunt medium diamond point with ring-threaded shank or medium needle point with ring-treaded shank; size and strength to securely and rigidly retain the work; sufficient length to penetrate substrate a minimum of 1-1/2 inches.

B. Siding Screws: “Dacrotized”, “Rustpert”, or hot dip galvanized; trim head; self taping for steel framing; sufficient length to penetrate metal framing a minimum of 1/2 inch.

2.03 FINISHES

A. Wood Siding and trim:

1. Prime paint all sides (face, back, and edges) of each siding and trim board prior to installing.
2. Touch-up and field prime cuts and other exposed wood.
3. Paint Coating: As specified by Section 09 91 00 – Painting.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully examine the installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 PREPARATION

A. Make necessary repairs as necessary to provide suitable substrate.

B. Back Kerfing: Back kerf trim and siding where necessary to prevent warpage and where indicated on Drawings.

C. Pre-primed Finish: Re-prime damaged primer at faces, sides, edges, backs and ends of siding and trim boards. Spot prime cut siding joints before installing. Sand cut edges smooth and clean.

1. Priming: After site acclimation and prior to installation, prime siding and trim in accordance with Section 09 91 00. Prime all sides and edges.

D. Metal Flashings:

1. Install under provisions of Section 07 62 00.
2. Install prior to installing building paper at horizontal intersections with other construction, such as doors and windows heads.
3. Lap materials as indicated on Drawings.

3.03 INSTALLATION

A. General Installation Requirements for Siding and Trim:

1. Arrange components to encourage watershed. Securely fasten in place, aligned, level, and plumb. Cut board ends over bearing surfaces.
2. Exercise care when site cutting. Cut edges shall be smooth and clean.
3. Allow 1/8 inch space for sealant at adjacent construction, and between siding and trim.
4. Align coursing wherever possible.
5. Fabricate exposed surfaces of special shapes to a uniform profile free of saw marks and other surface irregularities.
6. Components shall be plumb and level.

B. Shiplap Siding:

1. Install siding vertically in continuous lengths.
2. Blind nail at 16 inches on center at each framing member. Nails shall fully penetrate sheathing.
3. Install siding to minimize the number of butt joints. Butt joints where unavoidable shall be made over a stud and staggered between courses.
4. Cut siding to fit at perimeter and around penetrations with maximum 1/4 inch gaps. Sand and prime paint cut edges.
5. Fasten siding with bevel edge facing the exterior; smooth side out.
6. Rip siding and trim as necessary to lap to weather.
7. Install metal flashings at internal and external corners, sills, and heads of wall openings.

C. Trim:

1. Nail securely at each support.
2. At solid backing, fasten securely with nails 1 inch from the edge at 12 inches on center.
3. Allow space for sealant and flashing.
4. Butt joint outside corners where ever possible. Where not possible sand all exposed edges smooth and flush with adjacent surfaces.
5. Use exterior filler at all nail holes and surface imperfections, and sand smooth to match adjacent surfaces.
6. Do not nail into edges of material.
7. Exterior glue at all non-moving joints.
8. Do not allow uncoated surfaces to remain exposed to moisture.

D. Install metal flashings at internal and external corners, sills, and heads of wall openings to ensure water flow to the exterior. Fasten at 12 inches on center maximum.

E. Apply joint sealer between siding, trim, and adjacent surfaces as specified in Section 07 92 00. Ensure watertight condition.

F. General Fastening Requirements:

1. Surfaces to Receive Paint: Countersink nails and putty over flush with adjacent surfaces.
2. Arrange for orderly nailing pattern.
3. Apply touch up coating on surfaces and ends cut during installation.

3.04 ADJUSTING

A. Repair or replace damaged siding and installations not meeting specified tolerances.

3.05 CLEANING

A. Leave installations clean, premises free from residue of work of this Section, ready for field painting specified Section 09 91 00 – Painting.

END OF SECTION

SECTION 07 46 46

ENGINEERED WOOD SIDING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes engineered wood siding and including:

1. Panel and lap vertical siding
2. Trim and fascia.
3. Accessories:

    a. Fasteners.
    b. Sealant.
    c. Flashing.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry.
2. Section 07 62 00 – Sheet Metal Flashing.
3. Section 09 91 00 – Painting: Field Painting siding and trim

1.02 DEFINITIONS

A. Treated Engineered Wood: Engineered wood products manufactured for exterior use treated with manufacturer's proprietary process to resist fungal decay and termite damage.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals under provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Application Instructions.
2. Maintenance and Care Instructions.

C. Verification Samples: For each exposed product and texture specified, two samples, minimum size 6 inches (152 mm) long representing actual product, color, and patterns.

D. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Detail expansion joints, material joints, angle changes, flashings, and abutment to adjacent Work.

E. Samples for Verification: For each type, color, texture, and pattern required.

1. 1. 6-inch- long Sample of engineered wood siding and trim.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.05 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components and other manufactured items so as not to be damaged or deformed. Package components for protection during transportation and handling with manufacturer's name and identification of products.

B. Unload, store, and erect components in a manner to prevent bending, warping, twisting, and surface damage. Maintain slip sheet until piece is being prepared for installation.

C. Store components on flat surfaces clear of the ground. Store under roof or covered with suitable weathertight and ventilated covering, and in accordance with manufacturers' written instructions.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 COORDINATION

A. Coordinate engineered wood siding installation with flashings, trim, and construction of other adjoining work to ensure proper sequencing, construction progress, and to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Manufacturer's Trim and Siding Limited Warranty: Manufacturer agrees to repair or replace components of engineered wood siding against substrate damage within specified warranty period.

1. Substrate damage is defined as deterioration, buckling, and overlay issues caused by manufacturing defects or termite damage.
2. Hail damage is defined as a crack or chip in the surface overlay, or product substrate dents exceeding 3/8 inch (10 mm) in length or diameter and is caused by hail.
3. Limited Warranty Period: 50 years from date of installation and written to Owner on date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Bais of Design Manufacturer: LP Building Products, Green Bay, WI.

1. Substitutions: Section 01 25 00 – Substitution Procedures.

2.02 ENGINEERED WOOD SIDING

A. Basis of Design: LP SmartSide Primed Nickel Gap Cedar Texture Siding.

1. Description: Exterior-grade, phenolic resin-saturated, paper overlay laminated to EPA-registered zinc-borate preservative-treated engineered wood siding. Exposed edges sealed for moisture resistance.
2. Finish: Acrylic latex primer.
3. Thickness, ½ inch.
4. Style : Embossed Cedar Texture
5. Grooves: None.
6. Length: 16 feet.
7. Width: 8 inches.
8. Edges: Shiplap.

2.03 TRIM AND FASCIA

A. Basis of Design: Smartside Trim; as manufactured by LP Building Products.

1. Fire Rating: Class 1(A) fire rating required.

2. Finish: Acrylic latex primer.
3. Thickness, 540 Series: 0.910 inch (23 mm).
4. Style : Cedar Texture.
5. Width: As detailed.
6. Length: 16 feet.

2.04 VENTED SOFFIT

A. Product: LP SmartSide 38 series Soffit

B. Type: Exterior-grade, phenolic resin-saturated, paper overlay laminated to EPA registered zinc-borate preservative-treated engineered wood soffit.

1. Finish: Acrylic latex primer.
2. Thickness, 0.530 inch.
3. Style: Cedar texture
4. Types: Vented, cut-to -width soffit.
5. Width: 12 inches nominal.
6. Length: 16 feet.

2.05 ACCESSORIES

A. Fasteners: ASTM A 153:

1. Hot-dip galvanized or stainless steel nails with 0.113 inch (2.9 mm) diameter shank.
2. Penetrate structural framing or wood structural panels and structural framing a minimum of 1-1/2 inches (38 mm).

B. Sealant: ASTM C 920, minimum Class 25 sealant.

C. Flashing:

1. Provide flashing at window and door heads and where indicated on Drawings. Refer to Division 07 for sheet metal flashing.
2. Material: Aluminum.

a. Finish: High-performance organic finish.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

C. Verify location of concealed framing support and anchorage.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's application instructions approved submittals and in proper relationship with adjacent construction.

1. Install in accordance with conditions stated in ICC-ES ESR-1301 for strand substrate products and ICC-ES ESR-3090 for fiber substrate products.
2. Properly space joints to allow for equilibration.

B. Do not install over damaged or crooked materials.

C. Do not cut siding/cladding to fabricate trim; use trim components.

D. After installation, seal and flash joints, except the overlapping horizontal lap joints.

E. Seal around penetrations.

F. All wood substrate that is exposed to the weather must be sealed in a manner that prevents moisture intrusion and water build up.

1. Seal ALL exposed cuts of siding and trim. Field spray applied coatings on cuts are not recommended.
2. Sealing can be accomplished by applying a coating or sealant according to the manufacturer's requirements.
3. Butt joints that are covered with joint moldings, sealant, or factory prefinished ends are considered sealed from the weather.

3.04 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturers Care and Maintenance Instructions.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes providing sheet metal for the following applications:

1. Sheet metal flashing and trim for roofing applications.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry for wood nailers, curbs, and blocking; flexible flashing at openings.
2. Division 07 Roofing Sections: Sheet metal flashing integral with roofing membrane.
3. Section 07 92 00 – Joint Sealants for field-applied sheet metal flashing sealants.

1.02 REFERENCES

A. National Roofing Contractors Association (NRCA): The NRCA Roofing and Waterproofing Manual.

B. Sheet Metal and Air Conditioning National Association (SMACNA):

1. Architectural Sheet Metal Manual

1.03 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Completed sheet metal flashing shall not rattle, leak, or loosen, and shall remain watertight.
2. Design system capable of withstanding building code requirements for negative wind pressure.
3. Shop or field formed roof membrane termination are not acceptable.

B. Sheet Metal Standard for Flashing: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for SMACNA – Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Installation Requirements: Fabricator is responsible for installing system, including anchorage to substrate to maintain visual design concepts in accordance with Contract Documents and following installation methods as stipulated in the SMACNA.

1. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
2. Make modifications only to meet field conditions and to ensure fitting of system components.
3. Provide concealed fastening wherever possible.
4. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves.
5. Obtain Architect's approval for connections to building elements at locations other than indicated in Drawings.
6. Accommodate building structure deflections in system connections to structure.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Shop drawings:

1. Fully dimensioned large scale design details showing material profiles, splices, flashing terminations and other jointing details, fastening methods and installation details. Indicate material type, sizes, and weights or gages. Indicate extent of adjacent work specified under other Sections of the Specifications.
2. Fully detail methods of relieving stresses due to thermal movement, including sealing of expansion seams.
3. All details bearing dimensions of actual measurements taken at the project.

D. Selection Samples:

1. Metal sample chips, indicating Manufacturer's full range of finish colors for factory finishes available for selection by Architect.
2. Manufacturer's sample boards for sealant colors.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

D. Closeout Submittals:

1. Manufacturer’s warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture.

1.06 QUALITY ASSURANCE

A. Sheet Metal Flashing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Fabricator and Installer:

1. Company specializing in work of this Section with minimum 5 years documented experience installing commercial quality work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing materials in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering from exposure to sunlight and high humidity, except to extent necessary for period of installation.

1.08 COORDINATION

A. Coordinate installation of sheet metal flashing with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.09 WARRANTY

A. Pre-Finished Sheet and Sheet Coil Coating Warranties: Manufacturer's 20 year warranty, for each sheet material, against fading, color change, chalking, peeling, cracking, or delaminating.

PART 2 – PRODUCTS

2.01 EXPOSED SHEET MATERIALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

    a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.02 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.03 ACCESSORY MATERIALS

A. Accessories: Provide accessory components required for a complete finished installation.

B. Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and accessory items for a complete system and as recommended by sheet metal manufacturer and fabricator for metal work, unless otherwise indicated.

C. For preservative-treated and fire retardant-treated lumber, and High Humidity Area fasteners shall be stainless-steel connectors and fasteners (Type 304 or 316 stainless steel), copper or silicone bronze fasteners.

1. Mechanically galvanized fasteners and connectors are prohibited.
2. Fastener metal type for flashings shall match the flashing metal type.
3. Expansion type fasteners are prohibited for use in stone and brick.
4. Fasteners in masonry shall be installed in the mortar joints, or where required to be in the masonry unit, shall be drilled and set in epoxy.

D. Fasteners: Provide same metal as sheet metal or other non-corrosive compatible metal recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

E. Metal Accessories: Provide cleats, straps, anchoring devices, and similar accessory units for installation of work, noncorrosive, size and gauge required for performance.

2.04 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flatlockseams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FLASHING INSTALLATION – GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Coat side of stainless-steel sheet metal flashing and trim with isolation coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip-sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

1. Aluminum: Use aluminum or stainless steel fasteners.
2. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

I. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.03 INSTALLATION HEADER FLASHING

A. Install specified flashing at window heads, piping, vents and all other projections from vertical surfaces where rain water may accumulate. Flashing shall be of continuous length for full width of window head, joints in flashing is not acceptable. Flashing shall extend behind air infiltration barrier a minimum of 3 inches up the wall.

3.04 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Remove temporary protective coverings and strippable films as sheet metal flashing are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

C. Replace sheet metal flashing that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes manufacturer fabricated roof edge fabrications. Work includes, but is not limited to the following types:

1. Counterflashings and reglets
2. Underlayment
3. Accessories

B. Related sections:

1. Section 06 10 00 – Rough Carpentry for wood nailers, curbs, and blocking.
2. Section 07 54 00 – Thermoplastic Membrane Roofing
3. Section 07 62 00 – Sheet Metal Flashing: Custom- and site-fabricated sheet metal flashing and trim.
4. Section 07 92 00 – Joint Sealants for field-applied sealants.

1.02 DEFINITIONS

A. Prefabricated or Manufactured Roof Specialties: Items that will be plant manufactured ready for installation on a roof or parapet. Edge securement for low-slope roofs shall demonstrate compliance with ANSI/SPRI ES-1.

1.03 REFERENCES

A. ASTM International:

1. ASTM A 240/A 240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.
2. ASTM B 32 – Standard Specification for Solder Metal; 2020.
3. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants; 2018.

B. SMACNA – Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, Inc., 2012

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install roof specialties tested according to ANSI/SPRI ES-1 and conforming to the following:

1. ANSI/SPRI/FM 4435/ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
2. Design Requirements: Manufacturer is responsible for designing units, including anchorage to structural system and necessary modifications to meet specified requirements.

C. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

E. Roof Specialties: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

1.05 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations.

1. Identify manufacturer fabricated versus field-assembled work. Include the following:

a. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
b. Details for expansion and contraction.
c. Details of termination points and assemblies, including fixed points.
d. Details of special conditions, including accessory locations.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.

1.06 INFORMATIONAL SUBMITTALS

A. Quality Assurance/Control Submittals:

1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include preparation instructions and recommendations, storage and handling requirements and recommendations and installation methods.
2. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of roof edge flashings with performance requirements.

B. Closeout Submittals:

1. Warranty: Special warranty specified in this Section.
2. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Comply with applicable recommendations and details of the "Architectural Sheet Metal Manual" of the Sheet Metal and Air Conditioning Contractors National Association, Inc., and the National Roofing Contractors Association.

B. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.

C. Source Limitations: Obtain roof specialties approved by manufacturer providing roof-system warranty specified in Division 07.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

D. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.09 COORDINATION

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication indicate measurements on Shop Drawings.

B. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1. Verify that other trades and related work are complete before mounting roof specialties.

a. Ensure that information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
b. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

2. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
3. Refer to the construction documents, shop drawings and manufacturer's installation instructions.
4. Coordinate installation with roof membrane manufacturer's installation instructions before starting.

1.10 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

B. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.

2.02 EXPOSED SHEET METALS USED WITH COUNTERFLASINGS, ROOF EDGE FLASHINGS ASSOCIATED WITH ROOFING

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005 as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished indicated.

1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.03 CONCEALED METALS

A. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners: Series 300 stainless steel, unless otherwise noted.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant where indicated only; ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

1. Provide where sealant will be exposed or movement exceeds butyl sealant movement capacity.

E. Butyl Sealant unless otherwise noted: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt mastic, ASTM D 1187 or SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.05 ROOF EDGE FLASHINGS

A. Roof-Edge: Manufactured, one-piece and two-piece, roof-edge consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous galvanized steel anchor bar with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane.

1. Roof Edge Fascia Material: Formed Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, nominal 0.063 inch thick thickness as required to meet performance requirements.

    a. Surface: Smooth, flat finish.
    b. Finish: Two-coat fluoropolymer.
    c. Color: As selected by Architect from manufacturer's full range.

2. Waterdam: Continuous 24 gauge commercial type G-90 galvanized steel at 12’-0” standard lengths.
3. Corners: Matching corner units; factory mitered and continuously welded.
4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Accessories: End wall flashing, concealed splice plates, 8-inch minimum wide, finished to match finish of flashing with factory applied butyl sealant strips.
6. Provide endwall flashing splice plates where roof edge terminates into wall.

2.06 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. Cheney Flashing Company.
2. Fry Reglet Corporation.
3. OMG Roofing Products.
4. Keystone Flashing Company.
5. Metal-Era, Inc.
6. Heckmann Building Products Inc.

B. Counterflashings: Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings or roof membrane with joints lapped, from the following exposed metal in thickness indicated:

1. Aluminum: 0.032 inch thick
2. Stainless Steel: 0.0187 inch thick (fka 26 gauge)
3. Prepainted, Metallic-Coated Steel: 0.028 inch thick (fka 24 gauge)

C. Reglets/Receivers: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and - welded corners or mechanically clinched and sealed watertight, and junctions, from the following exposed metal in thickness indicated:

1. Stainless Steel: 0.0187 inch thick
2. Prepainted, Metallic-Coated Steel: 0.028 inch thick (fka 24 gauge)
3. Corners: Factory mitered and continuously welded or mechanically clinched and seal watertight.
4. Types:

    a. Surface-mounted with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
    b. For masonry application, refer to Section 04 22 00 – Concrete Unit Masonry.

D. Accessories:

1. Counterflashing wind-restraint clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing louver edge.
2. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.

2.07 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.
    c. Henry Company; Blueskin PE200 HT.
    d. Metal-Fab Manufacturing, LLC; MetShield.
    e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

2.08 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

B. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.09 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if recommended by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under flashings.
2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. Apply slip sheet, wrinkle free, over underlayment, before installing sheet metal flashing and trim.

3.03 INSTALLATION, GENERAL

A. General: Install manufactured roof specialties according to manufacturer's written instructions.

B. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

1. Install manufactured roof specialties with provisions for thermal and structural movement.
2. Torch cutting of manufactured roof specialties is not permitted.
3. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
4. Provide uniform, neat seams with minimum exposure of solder and sealant.
5. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
6. Do not use graphite pencils to mark metal surfaces.
7. Install water cut-offs, as recommended by membrane manufacturer, under the anchor bar.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum or stainless-steel manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt/synthetic underlayment and cover with a slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

D. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties.

E. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

1. When ambient temperature at time of installation is between 40 and 70 degrees Fahrenheit, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws or as recommended by fastener manufacturer to achieve maximum pull-out resistance.

G. Seal concealed joints with butyl sealant as required by manufacturer of roofing specialties.

H. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 degrees Fahrenheit.

3.04 COUNTERFLASHING AND REGLET INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: Installation of reglets is specified in Division 04 Section “Unit Masonry”.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

D. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric or butyl sealant.

3.05 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

C. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes joint sealants and fillers for the applications specified with the products in this Section and as indicated on Drawings. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Joint sealants and fillers, interior and exterior including silicone, urethane and latex joint sealants.

B. Related Sections:

1. Section 08 80 00 - Glazing for glazing sealants.
2. Section 09 29 00 - Gypsum Board for acoustical joint sealants.
3. Section 09 30 00 - Tiling for sealing tile joints.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 - Submittals Procedures.

B. Submit product data including catalog cuts, specification data, installation details, and manufacturer's certificate for each type of sealant required under the provisions of Section 01 33 00 - Submittal Procedures.

C. Product/Location List: Submit for approval a detailed list of locations where materials will be used, types of sealants which will be used at each location, and names of manufacturers of compounds, primers, and fillers which will be used. Submit manufacturer's certificate attesting that their products comply with specification requirements and are suitable and recommended for the use indicated.

D. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

E. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

F. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

A. Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.06 MOCKUPS

A. Mockups and Sample Installations: Provide mockups and sample installations of sealants at locations indicated or required by the Architect.

B. Mockups and sample installations shall represent the primary types of materials, substrate surfaces, joint size, exposure, and other conditions to be encountered in the work.

C. Preparation, priming, application. and curing, shall comply with manufacturer's recommendations and actual proposed methods.

D. Schedule the applications, with allowance for sufficient curing time, so that samples may be examined and necessary adjustments made at least 1 week prior to date scheduled for commencing installation of the work.

1. The mockups and sample installations shall be visually examined for staining, dirt pickup, shrinkage, color, general workmanship and appearance. Cut and pull the sealant from each sample joint to examine for internal bubbles or voids, adhesion, and general compatibility with substrate.

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing (All Exterior Wall and Exterior Assembly Sealants Only) : Submit to joint sealant manufacturers, prior to full size building sample installation(s), samples of materials that will contact or affect, by direct or indirect chemical or mechanical means, exterior wall joint sealants for compatibility and adhesion testing below.

1. General: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, curtainwall framing, exterior precast, exterior stone cladding, metal panels, face brick, other sealants, flashings, metal framing, and shims, prior to the construction of full sized sample installation(s).

a. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.
b. Investigate materials that fail compatibility and adhesion testing and obtain sealant manufacturer's written recommendations for corrective measures, which may include the use of primers, cleaners, cleaning measures, curing time, temperature limitations (surface and air), humidity conditions, moisture content of substrate, etc.
c. Definitions:

1) Compatibility: The capability of the sealant materials and substrates to be placed in direct contact with each other and maintain their required physical, chemical and visual qualities with the absence of softening, staining, oil exudation, discoloration or other detrimental, deleterious or degradative effects caused by chemical interactions.
2) Adhesion: The mechanical or chemical ability of the sealant materials and substrates to adhere or bond together at their interface.

2. Adhesion in Peel Testing:

a. Test Methods:

1) Comply with ASTM C794 'Adhesion and Peel of Elastomeric Joint Sealants'. modified to include project specific substrates and to report cohesive or adhesive failure mode. Samples of each exterior precast, exterior stone cladding, exterior face brick, other sealants, flashings, metal framing in contact with the concealed and exposed sealant materials are required to be tested.
2) Comply with ASTM C1135 'Determining Tensile Adhesion Properties of Structural Sealants', modified to include project specific substrates and the following. Sealant manufacturer's modified interpretations of ASTM C 1135 will not be permitted. Samples of each exterior structural glazing and metal framing in contact with the structural sealant materials are required to be tested. In addition to the testing being performed under the standard environmental conditioning required of ASTM C1135; the Contractor shall prepare, and test, additional specimens for each project specific environmental condition under which the sealant will be applied and cured.

b. All specimens shall be tested for primed and unprimed performance.
c. Report:

1) Date(s) of testing.
2) Project identification.
3) Test method (as identified herein).
4) Specimen substrate(s) tested.
5) Sealant(s) tested.
6) Substrate preparation (cleaning materials, methods and primers used).
7) Test results for each specimen tested (type of failure - adhesive or cohesive-force measured at failure in pounds per lineal inch).
8) Recommendations. Where testing shows equal or better performance without a primer, a primer will not be required.
9) Additional remarks, if any (i.e., color change of substrate or sealant, voids in the body of the sealant when examined in cross section, blistering. bubbling, sealant softening, or evidence of improperly mixed or cured sealant).

3. Preconstruction Field-Adhesion Testing: Before installing exposed exterior elastomeric sealants, field test their adhesion to joint substrates as follows:

a. Locate test joints where indicated or, if not indicated, as directed by Architect.
b. Conduct field tests for each type of exposed exterior elastomeric sealant and joint substrate indicated.

1) Perform 10 tests for the first 1000 feet of joint length for each type of exposed exterior wall sealant and joint substrate.
2) Perform one test for each 1000 feet of joint length thereafter.

c. The Architect and manufacturer's technical representative, shall be present when joints are tested.
d. Test Method: Test exterior elastomeric joint sealants by hand-pull method described below:

1) Install joint sealants in 60-inch long joints using same materials and methods for joint preparation and joint-sealant installation in accordance with manufacturer's final laboratory testing recommendations. Allow sealants to cure.
2) Make knife cuts from one side of joint to the other, followed by two cuts approximately 3-inch) long at sides of joint and meeting cross cut at one end. Place a mark l-inch from cross-cut end of 3-inch piece.
3) Use fingers to grasp 3-inch piece of sealant between cross- cut end and l-inch mark; pull firmly down at a 90-degree angle to the joint and hold sealant in this position for

ten seconds; following the ten second time duration pull sealant at a 180 degree angle parallel to the joint and hold the sealant in this position for ten seconds. Pull sealant away from joint to the distance recommended by sealant manufacturer for testing adhesion.

4) Repair joint as recommended by the sealant manufacturer.

e. Sealants evidencing adhesive failure with one or both substrates during testing, and/or a level of elongation prior to failure that is not in compliance with the performance characteristics specified herein or otherwise published by the sealant manufacturer will be subject to rejection by the Architect. Discontinue use of joint sealants, cleaning agents, primers, and application methods associated with failures documented during testing and immediately notify manufacturer and Architect for further review.

4. Report: Provide written summary of each compatibility and adhesion test.

1.08 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

B. Apply joint sealants as late as possible in the construction, preceding application of water repellent coatings if any, and painting and following cleaning operations.

C. Do not install solvent curing sealants in unventilated building spaces.

1.09 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period Silicone Sealants: 20 years from date of Substantial Completion.
2. Warranty Period Urethane Sealants: 5 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 – GENERAL

2.01 MANUFACTURERS

A. Specified Manufacturers and Products: To establish a standard of quality, design and function desired, Drawings and specifications have been based on the products specified under this section for each individual sealant type, for the applications scheduled at the end of Section, and as may be additionally identified on the Drawings.

B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:

1. Bostik, Middleton, MA
2. Dow, Midland MI.
3. GE Silicones, Waterford NY.
4. Pecora Corporation, Harleysville PA.
5. Sika USA Corp, Lyndhurst NJ.
6. Tremco, Inc., Beachwood OH.

2.02 JOINT SEALANT MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: Match Architect's samples.

2.03 SILICONE JOINT SEALANTS

A. Sealant Materials, General Requirements:

1. Only use sealant and primers that comply with the following limits for VOC content:

   a. Architectural Sealants: 250 g/L.
   b. Roofing Sealants: 450 g/L.
   c. Roadway Sealants: 250 g/L.
   d. Sealant primer: 250 g/L.

B. Joint Sealer **Type SC** (Silicone, general construction): One-part medium modulus, neutral-cure, synthetic sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, Grade NS, Class 50, use NT, with a minimum movement capability of ±50 percent, equal to the following:

1. Dow "Dowsil 756 SMS"
2. GE Silicones, "Silpruf LM SCS 2700"
3. Pecora, product, "895 NST"
4. Sika USA Sikasil WS 290 or WS 295
5. Tremco Commercial Sealants & Waterproofing: Spectrem 3

   a. Volatile Organic Compound (VOC) Content: 20 g/L maximum.
   b. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
   c. Staining, ASTM C 1248: None on concrete, marble, granite, limestone, and brick.

d. Color: As selected by Architect from manufacturer's standard line of not less than 15 colors.

C. Joint Sealer **Type SE** (Silicone, Exterior construction): Ultra low-modulus, high-performance, one-part, moisture-curing silicone joint sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, Grade NS, Class 100/50, Use NT, equal to the following:

1. Dow Corning, product, "790"
2. Sika, product "Sika Sil-C 990"
3. Momentive product "Silopruf LM SCS 2700"
4. Tremco, product "Spectrem 1"

   a. Volatile Organic Compound (VOC) Content: 1 g/L maximum.
   b. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
   c. Staining, ASTM C 1248: None on concrete, marble, granite, limestone, and brick.
   d. Color: As selected by Architect from manufacturer's standard line of not less than 12 colors.

5. Pecora product "890"

D. Joint Sealer **Type ST** (Silicone, color Tintable): Multi-component, neutral-curing, nonstaining, low dirt pick up, low-modulus silicone sealant having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, Grade NS, Class 50, Use NT, M, G, A, and O, with a minimum movement capability of +/- -50 percent, equal to the following:

1. Tremco, product "Spectrem 4-TS"

   a. Volatile Organic Compound (VOC) Content: 20 g/L maximum.
   b. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
   c. Staining, ASTM C 1248: None on concrete, marble, granite, limestone, and brick.
   d. Color: As selected by Architect from manufacturer's standard line of not less than 70 colors.

2. Dow Corning product "756SMS"
3. Momentive product "Silpruf NB SCS9000"
4. Pecora, product, "890 FTS"

E. Joint Sealer **Type SG** (Silicone, color (manufacturer standard): Single-component, neutral-curing, water-resistant, low-modulus silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, , with a minimum movement capability of +/-25 percent, equal to the following:

1. Dow Dowsil product “1199”

   a. Volatile Organic Compound (VOC) Content: 44.6 g/L maximum.

2. Tremco, product “Tremsil 600”
3. GE product “Silglaze 2800”

2.04 URETHANE JOINT SEALANTS

A. Joint Sealer **Type HL1** (Horizontal-self-Leveling, 1-component): Pouring grade self-leveling modified urethane or neutral cure silicone sealant, ASTM C 920 Uses T and NT, Type S, Grade P, Class 25, with a minimum movement capability of ±25 percent, equal to the following:

1. BASF, product, "MasterSeal SL1"
2. Sika, product, "Sikaflex 1cSL"
3. Tremco, product "Vulkem 45" / 45 SSL
4. Pecora product "Urexspan NR-201
5. Bostik product "Chem-Calk 955SL

B. Joint Sealer **Type HL2** (Horizontal-self-Leveling): Two-part, moisture-curing, low-modulus polyurethane sealant with a tintable base sealant, ASTM C 920, Type M, Grade P, Class 35; Uses T, O, and I, with a minimum movement capability of ±25 percent, equal to the following:

1. BASF, product "MasterSeal SL2"
2. Sika Corp., product, "Sikaflex 2cSL"
3. Tremco, product, "Vulkem 445SSL"

   a. Tensile Strength, ASTM D 412: 250 psi (1.7 MPa), at 100 percent elongation.

b. Tear Strength, ASTM D 412: 35 pli (6.1 kN/m).
c. Adhesion to Concrete, After Water, ASTM C 794: 28 pli (4.4 kN/m)
d. Hardness, ASTM C 661: 40 durometer Shore A, minimum.
e. Accelerated Weathering, ASTM C 793: Pass.
f. Volatile Organic Compound (VOC) Content: 106 g/L maximum.
g. Color: As selected by Architect from manufacturer's standard line of 70 colors

4. Pecora Chemical Corp. product "DynaTrol II-SG"

C. Joint Sealer **Type HT** (Horizontal-Trowel): Trowel grade multi-component modified-urethane or neutral-cure silicone paste sealant, conforming to ASTM C 920, with a minimum movement capability of ±25 percent, equal to the following:

1. BASF, product "MasterSeal SL2 (slope grade)"
2. Pecora, product "Dynatred"
3. Sika, product "Sikaflex 2CTG"
4. Tremco, product "THC-901"

D. Joint Sealer **Type P1** (Polyurethane 1-component): Low modulus single component gun- grade polyurethane sealant, non-sagging, conforming to ASTM C920, Type S, Grade NS, Class 35, with a minimum movement capability of ±35 percent, equal to the following:

1. BASF, product "MasterSeal NP1"
2. Pecora, product "Dynatrol I"
3. Sika, product "Sikaflex 1a"
4. Tremco, product "Dymonic FC"

a. Extrusion Rate ASTM C1183: 93.1 mL/min
b. Weight Loss ASTM C1246: Pass
c. Tack Free Time ASTM C679: 3 to 4 hr
d. Volatile Organic Compound (VOC) Content: 10 g/L maximum.
e. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
f. Color: As selected by Architect from manufacturer's standard line of not less than 15 colors.

5. Bostik product "Chem-Calk 900"

E. Joint Sealer **Type P2** (Polyurethane, Multi-component): Low modulus type, Multi-component non-sagging gun-grade polyurethane sealant, conforming to FS TT-S-000227E, Type II, Class A, and ASTM C 920, Type M, Class 25, Grade NS, uses T and NT, with a minimum movement capability of ±25 percent, equal to the following:

1. BASF, product "MasterSeal NP2"
2. Tremco, product "Vulkem 227"
3. Pecora, product "Dynatred"
4. Sika, product "Sikaflex 2c NS"

2.05 LATEX JOINT SEALANTS

A. Joint Sealer **Type AA** (Acrylic acoustical): One component acrylic latex, permanently elastic, non-staining, non-shrinking, non-migrating and paintable, and recommended for sealing interior concealed joints to reduce transmission of air-borne sound.

1. Tremco, product "Tremco Acoustical Sealant"
2. USG, product "USG Acoustical Sealant"
3. Pecora, product " AIS-919"
4. Momentive product "RCS20"

B. Joint Sealer **Type AP** (Acrylic latex or siliconized acrylic latex): One component acrylic latex caulking compound, conforming to ASTM C 834 Type P, Grade NF, for use NT; paintable within 24 hours after application, with a minimum movement capability of ±12.5 percent, equal to one of the following:

1. BASF, product, "Sonolac"
2. Tremco, product, "Tremflex 834"
3. Bostik, product, "Chem-Calk 600"
4. Pecora, product " AC-20+"

2.06 MILDEW-RESISTANT JOINT SEALANTS

A. Joint Sealer **Type SF** (Silicone, Food contact): One component silicone rubber, acceptable to local health officials, conforming to U.S. Food and Drug Administration regulation 21 CFR 175.105 and 175.300, FS TT-S-001543A, Type Non-Sag, Class A, and ASTM C 920, Type NS, Class 25, Use NT, G, O and A with a minimum movement capability of ±25 percent, and a Shore A minimum hardness of 20, equal to the following:

1. Dow Corning, product, "732"
2. GE Silicones, product "Series SCS1000"

B. Joint Sealer **Type SM** (Silicone, Mildew-resistant): One-part. ASTM C 920, Type S, Grade NS, Class 50, for use NT, minimum movement capability of ±50 percent, and a Shore A hardness of 20, equal to the following:

1. BASF, product "MasterSeal NP 150"
2. Dow Corning, product "786 Mildew-resistant"
3. Momentive product "SCS1700 Sanitary"
4. Tremco, product "Tremsil 200 Sanitary"
5. Pecora, "898NST"

2.07 MISCELLANEOUS JOINT SEALANTS

A. Joint Sealer **Type B** (Butyl): Gun-grade modified butyl and polyisobutylene sealant, conforming to ASTM C-1311, with a movement capability of ±10 percent or better and a Shore A hardness of 24 to 28, equal to one of the following:

1. Tremco, product "Butyl Sealant"
2. Pecora, product "BC-158"

B. Joint Sealer **Type BP2** (Bitumen modified polyurethane, Multi-component): Pouring grade self-leveling bitumen modified two component urethane sealant, conforming to ASTM C920, Type M, Grade P, Class 25 with a minimum movement capability of +50/-25 percent, equal to one of the following:

1. BASF, product "MasterSeal CR125"
2. Pecora, product "Urexpan NR-300"
3. Tremco, product "Vulkem 202"

C. Joint Sealer **Type FS** (Expanding Foam Sealant): Open cell polyurethane foam impregnated h an acrylic-polymer-modified, non-drying water-based asphalt emulsion.

1. Impregnation agent to have proven non-migratory characteristics
2. Compression when expanded in joint shall be at approximately 25% of its uncompressed dimension (4x compression).
3. Material to be supplied in sticks or rolls, precompressed to less than joint size at mean temperature for ease of installation
    a. Roll material will contain a nylon mesh (to reduce stretching) embedded into a pressure-sensitive adhesive on one side of the material
    b. Stick material to contain a pressure-sensitive adhesive on one face for aide in application
4. Acceptable Products:
    a. Emseal, product "25V
    b. Polytite, product "Polytite B"
    c. Sandell, model "Polyseal"

D. Joint Sealer **Type PE** (Polyether): Low modulus type, Single-component non-sagging gun- grade, low-odor, neutral curing polyether, sealant, conforming to ASTM C920, Type S, Grade NS, Class 50, Use NT with a minimum movement capability of ±50 percent, equal to the following:

1. BASF, product, "MasterSeal 150"
2. STS Coatings, product "GreatSeal PE-150" Sealant.
3. Chem Link, product "MetaLink"
4. York Manufacturing, product: "PE-150 Liquid Tape"

2.08 ACCESSORIES

A. Compressible joint bead back-up: Compressible closed cell polyethylene, extruded polyolefin or polyurethane foam rod complying with ASTM C 1330, Type C, 1/3 greater in diameter than width of joint. Shape and size of compressible back-up shall be as recommended by manufacturer for the specific condition used. Provide one of the following, or equal.

1. Nomaco, Inc., Zebulon, NC, product "Green Rod"
2. Industrial Thermo Polymers Ltd., Brampton, Ontario CN, product "ITP Standard Backer Rod"
3. BASF Construction Systems, product "MasterSeal 920 and 921"
4. W.R. Meadows Inc., Hampshire, IL, product "Sealtight Kool-Rod"

B. Type B: Bi-cellular reticulated, polymeric foam material with a surface skin, nonoutgassing, with a density of between 1.5-3.0 pcf (24-48 kg/cubic meter) per ASTM D1622 and minimum tensile strength of greater than 29 - 38 psi (200 - 267 kPa) per ASTM D1623, and with water absorption less than 0.058 oz./cubic inch (0.10 gm/cc) per ASTM C1016; one of the following:

1. SOFROD; Nomaco, Inc.
2. Soft Backer-Rod; BASF.

C. Primers: Furnish and install joint primers of the types, and to the extent, recommended by the respective sealant manufacturers for the specific joint materials and joint function.

D. Bond-breaker tape, and temporary masking tape: Of types as recommended by the manufacturer of the specific sealant and caulking material used at each application, and completely free from contaminants which would adversely affect the sealant and caulking materials. Provide self-adhesive tape where applicable.

2.09 MISCELLANEOUS MATERIALS

A. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surfaces adjacent to joints to which it is applied.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General:

1. Weather conditions must be dry and of the temperature, as recommended by sealant manufacturer, during application operations.
2. Surface receiving work of this section must be absolutely dry and dust free. All joints receiving sealant/caulking materials and primers shall be subject to the approval of the sealant manufacturer for proper use of specified materials.

B. Thoroughly clean all joints, removing all loose mortar, oil, grease, dust, frost, and other foreign materials that will prevent proper adhesion of primers and sealant materials.

1. Clean ferrous metals of all rust and coatings by wire brush, grinding or sandblasting.
2. Remove oil, grease and protective coatings with cleaners recommended by sealant manufacturer.

C. Prime joint substrates, as recommended in writing by joint-sealant manufacturer, as based on preconstruction joint-sealant-substrate tests or as based upon prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

D. Verify that joint backing and release tapes are compatible with sealant.

E. Perform preparation in accordance with ASTM C 804 and C 790 for solvent and latex base solvents, respectively.

3.03 INSTALLATION

A. General: Conform to SWRI requirements, and sealant manufacturer's written requirements for installation.

B. Install joint bead back-up in all joints in excess of 5/8-inch depth, and joints that have no back-up therein, placing the joint bead in the joint in a manner that will assure a constant depth 1/8 inch greater than the sealant and caulking material depth tolerances.

1. Set beads into joints continuously, by slightly stretching during placement, to permit compression against sides of joint, without surface wrinkles or buckles.
2. Do not stretch back-up material into joints.

C. Install bond breaker in joints where shown in the Drawings and wherever recommended by the sealant manufacturer to prevent bond of the sealant to surfaces where such bond might impair the Work.

D. Apply masking tape or other precautions to prevent migration or spillage of materials onto adjoining surfaces.

E. Apply urethane sealant and latex caulking materials into joints in accordance with manufacturer's instructions, using mechanical or power caulking gun equipped with nozzle of appropriate size, with sufficient pressure to completely fill the joints.

1. The depth of sealant and caulking materials shall be in accordance with manufacturer's recommendations for the specific joint function, but in no case exceed 1/2-inch in depth, nor less than 1/4-inch, regardless of the joint width.
2. Maintain the outer edge of the sealant and caulking materials, where side faces of joints are in the same plane, back 1/8-inch from the faces.
3. Apply sealant in continuous beads without open joints, voids or air pockets so as to provide a watertight and airtight seal for the entire joint length.
4. After placement of the sealant and caulking materials, concave-tool the surfaces to uniform density, using a water-wet tool. Do not use detergents or soapy water for the tooling operations.
5. Remove the temporary masking tape immediately after tooling, and before the sealant or caulking material has taken initial set.

F. Take care not to block-off weep tubes or any through wall opening constructed to allow weeping of accumulated water.

G. Apply pouring self-leveling urethane sealant (Sealant designation HL) into horizontal joints in accordance with manufacturer's instructions, to a level approximately 1/16 inch below adjacent surfaces.

1. Apply sealant without open joints, voids or air pockets so as to provide a watertight and airtight seal for the entire joint length.
2. After placement of the sealant and caulking materials, concave-tool the surfaces to uniform density, using a water-wet tool. Do not use detergents or soapy water for the tooling operations.
3. Remove the temporary masking tape immediately after tooling, and before the sealant has taken initial set.

3.04 INSTALLATION PRE-FORMED FOAM SEALANTS

A. General: The joint configuration and the joint surfaces shall be as detailed in the Drawings and in accordance with the current material Tech Data available from the Manufacturer. Field measurements of the depth and width of the joint shall be supplied to manufacturer before material is ordered.

B. Joint sealer/expansion joint material to be installed in strict accordance with the manufacturer's instructions.

1. Installed each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material.
2. Install in manner to provide seal continuity at ends, turns and intersections of joints.
3. Provide additional wet seal joints where required by manufacturer.

C. Remove all strip-off waste materials and excess foam sealant from site immediately upon completion of work.

3.05 CLEANING

A. Clean all surfaces of adjacent surfaces which have been marked or soiled by the work of this Section, removing all excess sealant and caulking materials with solvents which will not damage the surfaces in any way.

3.06 PROTECTION

A. During the operation of sealant work, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

3.07 SCHEDULE

A. General: Seal joints indicated and all interior and exterior joints, seams, and intersections between dissimilar materials.

B. Items Not to be Sealed:

1. Joints and penetrations in exterior gypsum sheathing. Use joint sealant as specified in Division 06 Section “Gypsum Sheathing.”
2. Joints covered by joint covers and seals specified in Division 07 Section “Expansion Joint Cover Assemblies.”
3. Penetrations in fire-rated assemblies. Use firestop sealants as specified in Division 07 Section “Penetration Firestopping.”
4. Joints, perimeter, and penetrations in sound-rated assemblies. Use acoustical sealant specified with sound-rated assembly in Division 09 Section “Gypsum Board.”
5. Weep holes in masonry, storefront, and windows.

C. Sealant Colors:

1. Colors for Sealant Types "P2" and "HL2": Match colors furnished by the Architect, or match other building materials as directed. Should such custom colors not be available from the approved manufacturer, except at additional charge, provide all such colors at no change in Contract Sum.
2. Colors for Sealant Types "BP2", "P1", "HL1", "HT", "SC", "SE", and "SM": As selected by the Architect from manufacturer's standard colors.
3. Color for Sealant Types "AA" and "AP": White.
4. Color for Sealant Type "B": Black.
5. Color for Sealant Type "PE": Black.
6. In concealed installation, and in partially or fully exposed installation where so approved by the Architect, standard gray or black sealant may be used.

D. Specialty Joint Conditions:

1. Sealing termination bars and through-wall flashing in cavity walls: Sealant type: PE.

E. Exterior joints (Listed by primary building material abutting sealant joints):

1. Concrete (including precast):

JOINT CONDITION	SEALANT TYPE
Concrete to concrete, vertical control joints:	SE or ST
Concrete foundation walls to abutting concrete, and other non-bituminous pavements, steps, platforms, and ends of ramp, (horizontal joints):	HL2

Concrete slabs on grade to abutting non-bituminous pavements (horizontal joints, including pedestrian traffic surfaces)	HL2
Concrete to concrete saw cut and tooled control and isolation joints in horizontal surfaces including pedestrian traffic surfaces	HL1 or HL2
Concrete and non-bituminous sloped (5% to 12%) pavement ramps (horizontal joint) at abutting concrete or masonry foundation walls	HT
Concrete to all items which penetrate exterior concrete walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items	P1
Precast concrete to abutting materials (vertical joints)	P1

2. Exterior Masonry:

JOINT CONDITION	SEALANT TYPE
Masonry to masonry, expansion and control joints	SE
Masonry to abutting non-porous materials (painted metals, anodized aluminum, mill finished aluminum, PVC, glass, and similar materials):	SE or ST
Masonry to abutting masonry, stone or concrete:	SE
Masonry to all items which penetrate exterior masonry walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items	SE or ST

3. Exterior Metal:

JOINT CONDITION	SEALANT TYPE
Metal to Metal	SE or ST
Metal to Glass	SE or ST

4. Rigid Insulation:

JOINT CONDITION	SEALANT TYPE
Joints between rigid roof insulation boards	I

5. Glazing Sealant:

JOINT CONDITION	SEALANT TYPE
Glazing setting, backbedding sealant on wood sash	SG

F. Interior joints (Listed by primary building material abutting sealant joints):

1. Interior Concrete:

JOINT CONDITION	SEALANT TYPE
Concrete to concrete (including precast), vertical joints:	SC
Concrete to concrete: horizontal walkable surfaces:	HL2
Concrete and non-bituminous pavement ramps (5 to 12 Percent) horizontal joints at abutting vertical concrete or masonry surfaces:	HT
Concrete to all items which penetrate concrete walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items	SC
Precast concrete to abutting materials (vertical joints):	SC

2. Interior Masonry: * Includes interior side of exterior masonry walls

JOINT CONDITION	SEALANT TYPE
Masonry to masonry control joints	P2
Masonry to Gypsum Board	SC
Masonry to all items which penetrate masonry walls, including, but not necessarily limited to, window frames, door frames, louver frames, and similar items:	SC
Masonry to all pipes, conduit and vents which penetrate non-rated masonry walls	SC

3. Gypsum Board:

JOINT CONDITION	SEALANT TYPE
Gypsum board to metal or wood trim:	AP
Gypsum board to abutting surfaces at exposed tops and bottoms partitions and walls	AA
Gypsum board to masonry:	SC
Gypsum board to interior door and window frames, penetrating conduits and piping, light-fixtures, electrical cover plates, building specialty items, ductwork, grilles, supply diffusers, faucets, piping, escutcheon plates and similar items	AP
Gypsum board to plumbing fixtures:	SM

4. Architectural Millwork and Casework:

JOINT CONDITION	SEALANT TYPE
Casework to abutting materials, kitchens, toilet rooms and similar "wet spaces":	SM
Casework to abutting surfaces (except in "wet" spaces):	AP
Countertops to abutting wall surfaces and to abutting casework:	SM
Countertops to plumbing fixtures and fittings:	SM

5. Interior Metal:

JOINT CONDITION	SEALANT TYPE
Metal to metal	SC
Bedding of metal thresholds	B

6. Interior Floor Drains:

JOINT CONDITION	SEALANT TYPE
Floor drains to concrete slab	P2
Floor drains to resilient sheet flooring	P2

7. Acoustical ceilings:

JOINT CONDITION	SEALANT TYPE
Acoustical ceiling edge angle to irregular wall surface	AP

8. Tile:

JOINT CONDITION	SEALANT TYPE
Tile to tile vertical, and horizontal non-traffic joints:	SM
Tile to tile, horizontal pedestrian traffic joints:	HL2

9. Interior Wood:

JOINT CONDITION	SEALANT TYPE
Wood to wood (natural or stained finishes)	SC
Wood to wood (painted opaque finishes)	AP or SC
Wood to metal	SC
Wood base to wall surfaces	SC

END OF SECTION

SECTION 08 11 00

METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes standard hollow metal doors, frames, sidelights and borrowed light frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 04 22 00 – Concrete Unit Masonry
2. Section 08 14 33 – Stile and Rail Wood Doors
3. Section 08 71 00 – Door Hardware
4. Section 09 91 00 – Painting: Field painting doors and frames.
5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.02 REFERENCES

A. SDI standards:

1. SDI-108-18 Recommended Selection and Usage Guide for Standard Steel Doors
2. SDI-111-09 Recommended Details and Guidelines for Standard Steel Doors, Frames, and Accessories
3. SDI-112-08 Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames
4. SDI-117-13 Manufacturing Tolerances for Standard Steel Doors and Frames
5. SDI-124-16 Maintenance of Standard Steel Doors and Frames

B. ANSI Standards:

1. ANSI/SDI A250.3-2019 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
2. ANSI/SDI A250.4-2018 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
3. ANSI/SDI A250.6-2015 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
4. ANSI/SDI A250. 8-2014 Specifications for Standard Steel Doors and Frames
5. ANSI/SDI A250.10-2020 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
6. ANSI/SDI A250.11-2012 Recommended Erection Instructions for Steel Frames (Formerly SDI-105)
7. ANSI A115.18 Hardware Preparation in Steel Doors and Steel Frames
8. ANSI/DHI A115.IG Installation Guide for Doors and Hardware

1.03 PERFORMANCE REQUIREMENTS

A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.20 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings: Show the following:

1. Elevations of each door and frame design.
2. For doors with thresholds, show coordination of threshold height and the threshold's integral seal with position of the bottom edge of the door for a proper closure an seal of the bottom of the opening.
3. Frame details for each frame type including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.

6. Details of anchorages, accessories, joints, and connections.
7. Details of conduit and preparations for power, signal, and control systems.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

1.05 QUALITY ASSURANCE

A. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

B. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

C. Doors shall be provided to conform with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and State and Local Regulations. These requirements supersede Technical Specifications in this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Doors and frames shall be stored vertically under cover. The units shall be placed on at least 4" high wood sills or in a manner that will prevent rust or damage. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided.

D. A ¼ inch space between the doors shall be provided to promote air circulation. If the wrapper on the door becomes wet, it must be removed immediately.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Steelcraft, ALLEGION, Cincinnati, OH.

B. Acceptable Manufacturers: Subject to compliance with requirements, products of the following manufacturers are acceptable:

1. Ceco Door; ASSA ABLOY, Chicago, IL
2. Curries Company, ASSA ABLOY, Mason City, IA
3. Pioneer Industries, ASSA ABLOY, Carlstadt, NJ
4. Republic Doors and Frames, ALLEGION, McKenzie, TN

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

2.03 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B..

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard.

2. Frames:

   a. Materials:

      1) Openings Up To and Including 48-Inches: Uncoated steel sheet, minimum thickness of 0.053 inch.
      2) Openings More Than 48-Inches: Uncoated steel sheet, minimum thickness of 0.067 inch.

   b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Full profile welded.

2.04 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A..

1. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
   d. Edge Construction: Model 2, Seamless.
   e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
   f. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
   g. Core: Manufacturer's standard.

2. Frames:

   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
   b. Construction: Full profile welded.

2.05 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.06 FRAME ANCHORAGE

A. Floor Anchors:

1. At bottom of jamb use 0.053 inch thick steel clip angles welded to jamb and drilled to receive two 1/4 inch floor bolts.
2. Form jamb anchors of not less than 0.042 inch thick steel unless otherwise specified.
3. Where floor fills occur, provide extension type floor anchors to compensate for depth of fill.

B. Jamb Anchors:

1. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 24 inches apart.
2. Anchors set in masonry: Use adjustable anchors designed for friction fit against the frame and for extension into the masonry not less than 10 inches. Use one of following type:
    a. Wire loop type of 3/16 inch diameter wire.
    b. T-shape or strap and stirrup type of corrugated or perforated sheet steel.
3. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.
4. Anchors for frames set in prepared openings:
    a. Steel pipe spacers with 1/4 inch inside diameter welded to plate reinforcing at jamb stops or hat shaped formed strap spacers, 2 inches wide, welded to jamb near stop.
    b. Drill jamb stop and strap spacers for 1/4 inch flat head bolts to pass thru frame and spacers.
    c. Two piece frames: Subframe or rough buck drilled for 1/4 inch bolts.
5. Anchors for observation windows and other continuous frames set in stud partitions.
    a. In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 4 feet long.
    b. Anchors spaced 24 inches on centers maximum.
6. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

2.07 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.08 FINISHES

A. Shop Painting:

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before the application of the shop coat of paint.
2. Clean, treat, and paint exposed surfaces of fabricated hollow metal doors and frames, including galvanized surfaces plus back prime exterior hollow metal door frames.
3. Apply shop primer that complies with ANSI A250.10 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.
4. Apply shop coat of prime paint of not less than 1.0 mil without runs, smears, or bare spots ready to receive field applied paint.

B. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A250.10 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied primer and topcoats. Apply shop primer immediately after surface preparation and pretreatment.

C. Field finishing of doors and frames is specified in Section 09 91 00 – Painting, and consists of primer plus two finish coats per the finish schedule.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Hollow Metal Frames: Install frames plumb, level, rigid and in true alignment as recommended in ANSI/SDI A250.11, “Recommended Erection Instructions for Steel Frames” and A115.IG, “Installation Guide for Doors and Hardware”. Frames shall be fastened to the adjacent structure so as to retain their position and stability.

1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
2. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
3. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
4. In-place concrete or masonry construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Grout hollow metal frames in exterior openings, interior frames installed in masonry and concrete construction and elsewhere as indicated.

    a. Where grouting is required in masonry installations, frames shall be braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Grout shall be mixed to provide a 4 inch maximum slump consistency, hand troweled into place. Grout mixed to a thin “pumpable” consistency shall not be used.

b. Place a temporary vertical brace in head frames for openings over 4 feet wide at the center to support frame head during installation until grouting has cured.

6. In-place gypsum board partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind door frames.

   a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   b. Install door silencers in frames.
   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

9. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
10. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

   1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.

D. Installation of hardware items shall be in accordance with the hardware manufacturer's recommendations and templates. A115.IG, "Installation Guide for Doors and Hardware" and ANSI/SDI A250.6, "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames" shall be consulted for other pertinent information.

3.02 ADJUSTING AND CLEANING

A. Remove grout and other bonding material from hollow metal work immediately after installation.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 33

STILE AND RAIL WOOD DOORS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes interior stile and rail wood doors, complete with hardware cutouts and provided with openings for glazing, where so indicated.

B. Section Includes:

1. Stile and Rail Doors
2. Factory Prefitting and Premachining
3. Finishing of Stile and Rail Doors

C. Related Sections

1. Section 08 11 00 – Metal Doors and Frames: Steel door frames.
2. Section 08 71 00 – Door Hardware
3. Section 08 80 00 – Glazing: Glass and glazing materials and installation.
4. Section 09 91 00 – Painting: Site finishing doors.

1.02 REFERENCES

A. ASTM D-1037 –91 American Society for Testing and Materials: Standard Methods for Evaluating the Properties of Wood-Based Fiber and Particle Board Panel Materials.

B. ANSI A208.1 – Urea-formaldehyde Emissions

C. Architectural Woodwork Standards, latest edition, published jointly by the Architectural Woodwork Institute, the Architectural Woodwork Manufacturer Association of Canada, and the Woodwork Institute.

D. WDMA I.S.6-A-07 - Window and Door Manufacturers Association.

1.03 ACTION SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittal Procedures

B. Product Data: Submit door manufacturer's product for each type of door required, including details of construction.

1. Include details of core and edge construction, trim for glazed light and louver openings and similar components.
2. Include finishing specifications for factory finished doors.
3. Include manufacturer’s certification indicating compliance with specification requirements.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door and frame construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:

1. Face veneer species
2. Dimensions of doors for factory fitting.
3. Locations and dimensions of mortises and holes for hardware.
4. Internal blocking for hardware attachment.
5. Requirements for veneer matching.

D. Samples: For factory-finished doors, submit a corner section of each type of door 12 inches square, showing required veneer, stile, rail, core and edge construction with face veneers factory finished.

E. Submit trim samples, 6 inch lengths, for glazed openings.

1.04 INFORMATIONAL SUBMITTALS

A. Information and Review Submittals:

1. Literature: Fabricator's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
2. Certification:
    a. General: Fabricator's written certification stating that doors, meet or exceed the requirements specified under this Section; that specified shop finishing has been performed.
    b. Provide signed certification by agent of door manufacturer stating that machining, glazing and finishing of doors shall be performed by only by the manufacturer in its facilities.

B. Manufacturer's Warranty:

1. Furnish the following warranties:
    a. 3 year warranty for interior stile and rail doors.
    b. 5 year warranty for exterior stile and rail doors.
2. Warranties shall include delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

1.05 QUALITY ASSURANCE

A. All materials and workmanship shall conform in all respects to the specified grades of the Architectural Woodwork Institute (AWI) publication "Architectural Woodwork Standards," except as modified herein.

B. Subject to compliance with the requirements specified herein, fabricators offering stile and rail doors which may be incorporated in the work must be AWI members in good standing.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Specified Manufacturer (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on TruStile Doors, LLC, Denver, CO.

2.02 INTERIOR DOORS – MDF CONSTRUCTION

A. Specified Manufacturer (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on TruStile Doors, LLC., product "TS Series – MDF."

B. Acceptable Manufacturers:

1. Trustile Doors, LLC. Denver CO.
2. Masonite International Corporation, Tampa FL.
3. Marshfield Door Systems Inc., Marshfield WI.

C. Construction: Pre-machined sheets fabricated from medium density fiberboard (MDF) conforming to ANSI A208.2 product class MD, fabricated from 100 percent recycled fiber, using formaldehyde free synthetic resin such as methyldiisocyanate (MDI), having a minimum density of 45 pounds per cubic foot (769 kg/m3).

D. Description:

1. Type: TruStile TS Series MDF Doors.
2. Size and Panel Types: See Drawings and specifications.
3. Stile Thickness: 1-3/4 inch.
4. Stiles and rails: Pre-machined MDO sheets as indicated above with keyed wood edges.
5. Glue type: Type 1, PVA - waterproof.
6. Profiles and dimensions shall be Trustile standards unless otherwise noted in the drawings and elevations.
7. STC rating 34 – Standard 1-3/4" doors for sound control.
8. Finish: Factory primed.

E. Finishing: One (1) coat factory primed, with additional finish coats applied in field after installation refer to Section 09 91 00 – Painting.

1. All corners and edges of units receiving film-forming finishes shall be eased/radiused to promote finish adhesion and maintain proper film thickness.

2.03 INTERIOR STILE AND RAIL DOORS

A. Interior Stile and Rail Doors: Fabricate doors in accordance with AWI "Custom Grade" requirements, Section 1400 for site applied opaque painted finish.

1. Face Panels: Manufacturer's standard 2-ply face panels with minimum 1/16 inch thick hardwood crossbands.
2. Face Veneers: Standard thickness, Poplar hardwood in accordance with AWI.
3. Core:

   a. AWI Spec Symbol PC-5 Particle Board or LSL-5 Timberstrand for non-rated doors.
   b. AWI Spec Symbol FD for fire rated doors, bearing Underwriters Laboratories or Warnock Hersey label for fire resistance indicated.

4. Thickness: As indicated.
5. Edge Strips: Side edges hardwood species matching face veneer; top and bottom edges hardwood mill option.
6. Adhesive: AWI 1300-S-3, Type 1 waterproof.
7. Openings: Factory cut and trim scheduled light and louver openings.
8. Door Finish: Unfinished, sanded smooth for job site finishing provided under Section 09 91 00 – Painting.
9. Stile and rail dimensions, molding profiles, panel characteristics, and design as detailed.

2.04 WOOD FRAMES AND JAMBS FOR TRANSPARENT FINISH

A. Quality Standard: Meet or exceed AWS Custom Grade, and as necessary to match frames to stile rail doors and historic configurations.

B. Fabricate wood frames to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Fabricate wood frames members in continuous lengths. No finger jointing is allowed.

D. Fabricate and machine for tight butt corner joints. Pre-assemble prior to shipping to verify tight joints and fit.

E. Frame Configurations: As indicated on the Drawings.

2.05 FABRICATION – GENERAL

A. Fabricate doors in accordance with AWI Quality Standards requirements.

B. Provide lock blocks at lock edge and elsewhere as required for proper hardware reinforcement.

C. Vertical Exposed Edge of Stiles: Of same species as veneer facing, to receive finish. No finger jointed stock permitted.

D. Fit door edge trim to edge of stiles after applying veneer facing.

E. Bond edge banding to cores.

F. Fabricate stile and rail wood doors in sizes indicated for field fitting.

G. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable. Miter wood moldings at corner joints.

H. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Section 08 80 00 – Glazing. Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.

2.06 PREFITTING AND PREPARATION FOR HARDWARE

A. Prefit and premachine wood doors at factory, including beveling both edges 1/8 inch in 2 inches. Where pairs of doors are scheduled, prefit and premachine as pairs. Where pairs of doors are scheduled with 3 point latching, lockset and flush bolts, the strike edge of the inactive leaf shall be square.

B. Rated and nonrated door shall comply with tolerance requirements of NFPA 80 for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

1. Top and hinge edges: 1/8 inch
2. Single door, lock edge: 1/8 inch
3. Pair meeting edge: 1/16 inch per leaf
4. Bottom (rated or nonrated):

    a. 1/2 inch from decorative floor covering.
    b. 3/4 inch maximum from top of noncombustible floor.
    c. 3/8 inch maximum from top of noncombustible sill or threshold.
    d. Doors with vertical rod exit devices, manual or automatic flush bolts shall be undercut for latching of bolts to a flush floor strike or threshold.
    e. See Room Finish Schedule, for floor finish materials.

C. Coordinate with the metal frame supplier the locations of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

D. Light openings and other detail work where shown shall be in accordance with manufacturer's standard detail or as detailed by the Architect. Exception to details as indicated for particleboard core doors that may affect the manufacturer's warranty of these doors shall be as specified herein.

2.07 SHOP PRIMING

A. Doors for opaque finish: Shop prime exposed portions of doors for paint finish with one coat of wood primer specified in Section 09 91 00 – Painting.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Comply with Section 01 60 00:

1. Before installation, verify that frames are proper size and type for door and are installed plumb and square as required for proper installation of doors.
2. Inspect doors for any damage, manufacturing defects or prefinish inconsistency prior to installation.
3. Notification: Notify General Contractor of unsatisfactory conditions in writing with copy to Architect.

B. Acceptance: Beginning of work will indicate acceptance of existing conditions by installer.

3.02 PREPARATION

A. Conditioning: Condition doors to average humidity in installation area prior to hanging.

B. Prefitting: Prefit doors to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

C. Sealing: Before installation of hardware brush apply primer to all job site cut or planed surfaces.

1. Primer: Type recommended by manufacturer.

3.03 INSTALLATION – WOOD FRAMES

A. Grade: Install wood frames to comply with same grade as item to be installed.

B. Assemble wood frames and complete fabrication at project site to the extent that it was not completed in the shop.

C. Install wood frames level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut wood frames to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Secure frames with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.

1. Anchor wood frames to anchors or blocking built in or directly attached to substrates.
2. Screw frames to wood framing by screwing in from back side of stud where possible.
3. Set exposed fasteners using finish head nails or screws. Fill holes with wood filler.

3.04 INSTALLATION – WOOD DOORS

A. Install doors in accordance with manufacturer's printed installation instructions and AWI Section 1700 Installation of Architectural Woodwork (Interior).

1. Install fire-rated doors in accordance with NFPA 80, Intertek/Warnock Hersey (WHI), and UL requirements as applicable.

B. Install doors accurately in frame, within clearances specified. Install hardware in accordance with manufacturer's written instructions and associated templates. Refer to Section 08 71 00 for general installation requirements.

1. Install doors to operate freely, but not loosely, free from hinge bound conditions, sticking, or binding. Do not install in frames which would hinder operation of doors.
2. Ensure doors are free from rattling when in latched position.
3. After installation of hardware, adjust and check each door to ensure proper operation and function.
4. Replace or rehang doors which are hinge bound and do not swing or operate freely.
5. Remove and replace doors which are warped, twisted or which are not in true planes.
6. Replace shop finished doors damaged during installation.

C. Conform to AWI requirements for fit tolerances. Coordinate floor clearance with finish floor coverings.

D. Coordinate installation of glass and glazing. Install in accordance with manufacturer's details. Miter stops at corners.

E. Hardware: For installation, see Division 08 Section "Door Hardware."

F. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

G. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

H. Field-Finished Doors: Refer to the following for finishing requirements:

1. Section 09 91 00 – Painting.

3.05 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

C. Adjust hardware so that doors work properly.

END OF SECTION

SECTION 08 14 74

SLIDING BARN DOOR

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Custom fabricated exterior sliding barn door.

1. Drawing identification: WD3

B. Related Sections:

1. Section 05 50 00 – Metal Fabrications: Steel frame for sliding door assembly.
2. Section 07 64 23 – Wood Siding: Wood Materials
3. Section 09 93 00 – Staining and Transparent Finishing: Finish for sliding barn door.
4. Section 09 96 00 – High Performance Coatings: Coating systems for exposed steel barn door framing.

1.02 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WWPA: Western Wood Products Association.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 –Submittal Procedures.

B. Product Data: For each type of manufactured product.

C. Shop Drawings: Show door configuration and assembly details. Show hardware placement and mounting provisions. Indicate adjacent construction including flashing and weather stripping provisions. Show steel reinforcements.

D. Sample: Submit a minimum 24 inch square sample of the door corner assembly

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specialized in the shop fabrication of custom door assemblies meeting the performance requirements specified.

PART 2 – PRODUCTS

2.01 WOOD MATERIALS

A. Softwood Plywood: DOC PS 1; CD grade; Exterior; plywood.

B. Door Cladding: Matching the exterior siding specified in Section 07 64 23 – Wood Siding.

2.02 ACCESSORIES

A. Hardware Components:

1. Door Rollers: Bottom mounted rollers with provisions for lifting the door to allow opening of the door; ball bearing and disengagement from weatherstripping assemblies; sized to support the weight of the door.
2. Bottom Door Track: Aluminum track to accept door bottom rollers; flush mounted with adjacent floor surfaces.
3. Door Pull: As selected.
4. Reinforcements: Galvanized steel or stainless steel.
5. Locks: Interior mounted keyed locks.

2.03 DOOR FABRICATION

A. Sliding barn door shall be shop fabricated to the greatest extent possible.

B. Door shall be clad with vertically running wood boards on the interior and exterior sides, to match the adjacent siding. Install boards over laminated plywood core.

C. Provide matching wood trim to match the cladding at exposed ends and other unfinished conditions.

D. Coordinate fabrication of steel perimeter frame and supports to receive wood members. Coordinate shop application of high performance coatings system to steel surfaces as specified in Section 09 96 00.

E. Fabricate door to receive hardware components.

F. Finish door with polyurethane finish specified in Section 09 93 00.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.02 INSTALLATION

A. Install sliding door in accordance with the approved Shop Drawings.

B. Install for accurate alignment with adjacent construction as necessary for weather tightness and smooth operation.

3.03 ADJUSTING

A. Adjust door assembly for smooth and easy operation. Adjust as necessary for a tight air seal when the door is in the closed position.

3.04 CLEANING

A. Clean exterior exposed door surfaces. Touch up finishes to restore damaged or soiled areas.

B. Leave ready to receive transparent finishes as specified in Section 09 93 00.

3.05 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 08 36 13

SECTIONAL OVERHEAD DOOR

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes glazed aluminum insulated sectional overhead door and includes:

1. Electric operator and controls
2. Operating hardware, tracks and support to structure.

B. Related Sections include the following:

1. Section 05 50 00 – Metal Fabrications for miscellaneous steel supports.
2. Section 08 71 00 – Door Hardware for lock cylinders and keying.

1.02 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors

1.03 DEFINITIONS

A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide sectional door capable of withstanding the effects of gravity loads and stresses without evidencing permanent deformation of door components:

B. Operation-Cycle Requirements: Design sectional door components and operator to operate for not less than 20,000 cycles.

C. Wiring Connections: Requirements for electrical characteristics. Refer to electrical drawings.

1.05 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures::

B. Product Data: For sectional door and accessories. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

1. Shop Drawings: Plans, sections, elevations and details including framing members, anchors, clearances, and accessories. Drawings shall show relationship with adjacent materials.
2. Summary of forces and loads on walls and jambs.

C. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

D. Closeout Submittals: Furnish operating and maintenance manual.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer with a minimum of five years documented experience, who is an authorized representative of the sectional door manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain sectional door through one source from a single manufacturer.

1. Obtain operators and controls from the sectional door manufacturer.

C. Field verify as-built conditions prior to fabrication.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.08 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Door as manufactured by Wayne-Dalton Commercial Doors, Lewisville, TX.

1. Product: Model 452

B. Subject to compliance with requirements, provide the basis of design product or a comparable product by one of the following:

1. Overhead Door Corp.
2. C.H.I. Overhead Doors
3. Clopay Building Products

2.02 GLAZED ALUMINUM SECTIONAL OVERHEAD DOOR

A. Glazed Sectional Overhead Doors: Wayne Dalton 452 Series Aluminum Doors. Units shall have the following characteristics:

1. Door Assembly: Stile and rail assembly of aluminum alloy 6063-T6, 1-3/8 inch thick stiles and rails, joined with self-tapping screws.

a. Rails: Top and bottom rails with 3-1/2 inches wide, lower intermediate rail 1-3/8 inches, upper rail 1-5/8 inches, minimum wall thickness 0.062 inch.
b. Stiles: Top, bottom, and end stiles are 3-1/2 inches wide, center stile 3 inches wide, minimum wall thickness 0.062 inch.
c. Springs:

1) Standard cycle spring: 10,000 cycles

d. Glazing:

1) 1/2 inch Low-E insulating clear tempered glass.

2. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

a. Powder Coating Finish: Color as selected by Architect from manufacturer’s optional RAL Powder Coat options.

3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:

a. Keyed lock with interlock switch for automatic operator.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of overhead door.

1. Provide continuous flexible seals at door jambs for a weathertight installation.

C. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

1. Size: 2 inch.
2. Type: Vertical lift
3. Vertical track shall be graduated to provide wedge type weathertight closing with continuous angle mounting for steel or wood jambs, and shall be fully adjustable to seal door at jambs.

D. Electric Motor Operation: Provide UL listed electric operator, equal to Genie Commercial Operators, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.

1. Duty: As required for performance requirements.
2. Entrapment Protection: Required for momentary contact, includes radio control operation.
    a. Electric sensing edge monitored to meet UL 325/2010 equal to Miller Edge.
    b. Photoelectric sensors monitored to meet UL 325/2010
3. Operator Controls:
    a. Key operated control stations with open, close, and stop buttons.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall opening is ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

G. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.04 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean doors, frames and glass using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONT

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior storefront system including exterior manual swing aluminum doors at entrances, complete with insulated glazing as indicated on drawings.
2. Installation of door hardware in accordance with Section 08 71 00 – Door Hardware.

B. Related Sections:

1. Section 07 92 00 – Joint Sealants for system perimeter sealant.
2. Section 08 71 00 – Door Hardware for hardware to the extent not specified in this Section.
3. Section 08 80 00 – Glazing: Materials and installation.
4. Division 26: For rough-in for control wire and cable for low energy automatic door operators and security hardware.

1.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design aluminum storefront system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design and provide means to anchor the storefront system to the building structure. Storefront fabricator/installer shall provide all engineering required to fabricate, attach, and install storefront system to other construction.

B. General: Provide aluminum storefront system capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:

1. Air infiltration and water penetration exceeding specified limits.
2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.

C. Glazing: Physically and thermally isolate glazing from framing members.

D. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.

E. Wind Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

1. Structural Properties Wind Loads: Indicated in Structural General Notes on structural drawings.
2. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.
3. Static-Pressure Test Performance: Provide storefront system that does not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

   a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
   b. Duration: As required by design wind velocity; fastest 1 mile (1.609 km) of wind for relevant exposure category.

F. Dead Loads: Provide storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

1. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of glazing or other fixed part immediately below.

G. Live Loads: Provide storefront system, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

H. Air Infiltration: Provide entrance and storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.

I. Water Resistance: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 12 lbf/sq. ft. Water leakage is defined as follows:

1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.

J. Thermal Movements: Provide storefront system, including anchorage, that accommodates thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, and other detrimental effects.

1. Temperature Change (Range).

a. 0°F (-18 C) to 180°F (82 C) maximum change (range) in ambient and surface temperatures
b. 75°F (24 C) test interior ambient air temperature

2. Test performance shows no buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5 for a minimum 3 cycles.

K. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

L. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.1.

M. Thermal Transmittance (U-factor):

1. Thermal transmittance test results are based upon 1" clear high-performance insulating glass 1/4" (e=0.035, #2), 1/2" aluminum spacer and argon fill gas, 1/4".
2. When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than listed here:

a. Trifab® Versaglaze® 451T Framing System, Front Plane (0.28 COG) 0.32 Btu/hr/ft2/°F per AAMA 507.

N. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop Drawings: Submit shop drawings for fabrication and installation of aluminum entrances and storefront systems and associated components of the work including the following:

1. Include fully dimensioned typical and special unit plans and elevations, sections at 1/2-inch scale and details at 3-inch scale or larger, and the following information:

a. Tolerances.

b. Profiles of members.
c. Anchorage system.
d. Connections and fasteners.
e. Provisions for expansion and contraction.
f. Flashings and drainage.
g. Finishes.
h. Glazing.
i. Interface with building construction.

2. Include setting drawings, templates, and directions for the installation of anchor bolts and other anchorages installed as a unit of work under other sections.

D. Samples: Submit material and finish samples required for the work:

1. Samples showing type and color of painted aluminum finish, on 12 inch long sections of extrusions and on 6 inch square sheets.

E. Delegated-Design Submittal: For storefront indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation in the jurisdiction where the project is located.

1.04 INFORMATIONAL SUBMITTALS

A. Maintenance Data: Furnish written instructions to Owner describing recommended materials and methods for proper maintenance of storefront system.

B. Test Reports: Furnish manufacturer's written test reports substantiating products meet or exceed performance requirements specified herein.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Provide aluminum storefront framing systems manufactured by a single firm, providing single-source responsibility for all components of the work.

B. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

1. Engineering Responsibility: Prepare data for storefront systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

C. Standard of Quality:

1. The specifications and drawings show and define the essential minimum requirements for quality of materials, construction, finish and overall installation.
2. Minor variations in construction techniques between manufacturers will be permitted, providing specified standards of materials, design, function, dimension, configuration, strength, quality and performance are met.

1.06 DELIVERY, STORAGE AND HANDLING

A. Pack, deliver, handle, store and protect materials from damage in accordance with AAMA Curtain Wall #10. "Care and Handling of Architectural Aluminum" recommendations.

1. Remove paper type wrappings when unloading.
2. Store materials inside the buildings whenever possible in clean, dry ventilated areas free of dust or corrosive fumes.
3. Stack members vertically or on edge, shim between components to provide water drainage and ventilation. Protect with adequate coverings, placed to provide water drainage and ventilation. Protect with adequate coverings, placed to provide adequate air circulation.
4. During installation, protect materials from lime, mortar, run-off from concrete and copper, weld splatter, acids, roofing materials, solvents and abrasive cleaner.

5. Do not incorporate damaged materials into the work.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. General: Coordinate approved hardware items with the finish hardware supplier. Contractor will not be entitled to any claims for failure to do this required coordination.

C. Receive and install all required finish hardware for aluminum and glass doors. Reinforce doors and frames where mortised for hardware with backing plates as required to ensure adequate strength of the connection. Obtain hardware templates from finish hardware supplier.

1.08 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of storefront system that fails in materials or installation within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Failure of system to meet performance requirements.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Water leakage through fixed glazing and frame areas.

C. Warranty Periods:

1. Labor and Material: Two (2) years from date of Substantial Completion.
2. For metal finishes: Ten (10) years from Substantial Completion.
3. For glass refer to Section 08 80 00 – Glazing

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design: Contract Documents are based on products and systems specified to establish a standard of quality. Other named acceptable manufacturers/fabricators offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

1. Basis of Design Products: Kawneer Co., Inc.

   a. Exterior Storefront System: Trifab VersaGlaze 451T Framing System, 2" x 4-1/2" Front Set.

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include those indicated below.

1. YKK AP America Inc
2. Oldcastle Building Envelope.
3. EFCO Corporation

2.02 MATERIALS AND ACCESSORIES

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

D. Secondary Sealant: For use as weatherseal, compatible with structural silicone sealant and other system components with which it comes in contact, and that accommodates a 50 percent increase or decrease in joint width at the time of application when measured according to ASTM C 719.

E. Glazing as specified in Section 08 80 00 – Glazing.

F. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Section 07 92 00 – Joint Sealants.

G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

H. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.

1. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
2. Provide Phillips flat-head machine screws for exposed fasteners.

I. Concealed Flashing: Dead-soft stainless steel, 26 gage minimum, or extruded aluminum, 0.062 inch minimum, of an alloy and type selected by manufacturer for compatibility with other components.

J. Trim and Accessories: As required to complete the work, finish to match aluminum entrances and storefront finish. Finish after fabrication, unfinished exposed edges at holes and trim terminations are not acceptable.

K. Brackets and Reinforcements: Manufacturer's high-strength aluminum units whenever possible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A123.

L. Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A123.

2.03 STOREFRONT FRAMING SYSTEM

A. Thermal Barrier (Trifab™ VG 451T):

1. Thermal Break with a 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.

a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

2.04 ENTRANCE DOORS

A. Basis-of-Design Product:

1. Kawneer North America, Inc. Series 500T Insulpour thermal entrance door; "500 Tuffline" wide stile door.
2. YKK AP Series 50XT thermal door; 50H non-thermal wide stile door.
3. EFCO Corporation Series "D-502" wide stile thermal door, "403T" center set, thermal storefront, "402" non-thermal storefront,.
4. Oldcastle Building Envelope Series "500T" wide stile thermal door, "3000T" center set, thermal storefront, "3000" center set, non-thermal storefront,.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated, and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Wide stile; 5-inch nominal width.
3. Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

4. Door Finish: High-Performance Organic Finish (Three-Coat Fluoropolymer):

C. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.1875 inch thick and reinforced as required to support imposed loads.

1. Nominal Size: As indicated on Drawings.
2. Exterior Framing Construction: Thermally improved.
3. Finish: Match door finish.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

    a. Sheet and Plate: ASTM B209.
    b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
    c. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
    d. Structural Profiles: ASTM B308/B308M.

2. Steel Reinforcement:

    a. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
    b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
    c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

3. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

G. Door Hardware: As specified in Section 08 71 00 – Door Hardware except as follows:

1. Weather Stripping: Manufacturer's standard replaceable components.

    a. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
    b. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.05 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

1. Fabricate components that, when assembled, have the following characteristics:
2. Profiles that are sharp, straight, and free of defects or deformations.
3. Accurately fitted joints with ends coped or mitered.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

C. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

D. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

F. Prefabrication: Complete fabrication, assembly, finishing, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.

G. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

H. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.

I. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

J. Fasteners: Conceal fasteners wherever possible.

2.06 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish Application:

1. Apply high performance organic coatings to all exposed exterior surfaces of glazed aluminum storefront components.
2. Adhesion and Compatibility Testing: Test samples of aluminum coatings on aluminum will be required for compatibility and adhesion testing of all sealants proposed for use on framing components. Refer to Section 07 92 00 ‘Joint Sealants’.
3. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Coating Finish: AA-C12C42R1x and the following:

1. Polyvinylidene fluoride finish coating containing not less than 70% of "Kynar 500" or "Hylar 5000" fluorocarbon resin specially formulated for spray application to extrusions and preformed aluminum metal shapes. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish. Coating films shall be uniform and visibly free from flow lines, streaks, blisters, sags or other surface imperfections in the dry-film state on all surfaces.
2. Thickness:
    a. Fluoropolymer 2-Coat Coating System: Minimum 1.2 mil total dry film thickness (0.25 mil primer +/- 0.05 mil and 1.0 mil topcoat).
    b. Coating Performance Criteria: Meets or exceeding AAMA 2605.
3. Color: Custom color as selected by the Architect.

PART 3 – EXECUTION

3.01 PREPARATION

A. Field Measurements: Take field measurements and coordinate the preparation of shop drawings and fabrication, to ensure proper fitting of work.

B. Examine substrates, supporting structure and installation conditions. Do not proceed with erection until satisfactory conditions have been corrected.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install the aluminum entrance and storefront systems in accordance with manufacturer's instructions and final shop drawings.

B. Do not install component parts which are observed to be defective, including warped, bowed, dented, abraded or broken. Remove and replace members which have been damaged during installation or thereafter before time of acceptance.

C. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength, or result in a visual imperfection or a failure in performance of the work.

D. Apply a bituminous coating or other permanent separator on concealed contact surfaces of dissimilar materials, before assembly or installation to prevent corrosive or electrolytic action.

E. Install component parts plumb, level, and true to line, without warp of framing members. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials. Use erection equipment which will not mar or stain finished surfaces and will not damage component parts.

F. Anchor component parts securely in place by bolting, or other permanent mechanical attachment system, which will comply with performance requirements and permit movement as required.

G. Install glazing as specified in Section 08 80 00 – Glazing.

3.03 FIELD QUALITY CONTROL TESTING

A. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    a. Perform a minimum of three tests in areas as directed by Architect.
2. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

3. Prepare test and inspection reports.

B. Subsill Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Sill Dam Test: Field test to ensure the integrity of the subsill with the test outlined in AAMA 511, *Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products*,
2. Drainage mechanisms of the subsill are temporarily sealed (commonly with tape) and water is introduced into the subsill and held for 15 minutes while the interior and underside of the subsill are monitored for leakage.
3. Test will be considered successful if no water leakage is evident per the protocols of AAMA 511.

3.04 ADJUSTING, CLEANING AND PROTECTION

A. Adjust operating hardware to function properly, without binding, and to prevent tight fit and contact points and weatherstripping.

B. Clean completed system, inside and out, promptly after erection and installation of glazing. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces.

C. Institute protective measures and other precautions required to assure that aluminum entrances will be without damage or deterioration, other than normal weathering, at time of acceptance.

D. Immediately before acceptance of the work, clean the aluminum entrance and storefront system thoroughly, inside and out. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compound, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon completion of the work.

END OF SECTION

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes glazed aluminum curtain wall assemblies for the project. The aluminum curtain wall assemblies work includes the following:

1. Exterior curtainwall

B. Systems consist of the following:

1. Curtain wall framing.
2. Aluminum trim, snap in sealant stops, flashings, parapet copings, and similar items in conjunction with aluminum curtain wall assemblies.
3. Internal steel and aluminum reinforcements.
4. Internal and perimeter weeps, vents and gasketing systems.
5. Anchors, embedments, shims, fasteners, inserts, expansion devices, accessories, support brackets, attachments, and grout.

C. Related Sections:

1. Section 07 62 00 – Sheet Metal Flashing: Stainless steel flashing installed as part of the curtain wall system.
2. Section 07 92 00 – Joint Sealants for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
3. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.
4. Section 08 80 00 – Glazing for glass and glazing of aluminum curtainwall systems.

1.02 REFERENCE STANDARDS

A. The following Standards are incorporated into these Specifications. Unless otherwise noted, comply with the current version of these Standards.

B. American Architectural Manufacturers Association (AAMA):

1. Aluminum Curtain Wall Manual No. 10, “Care and Handling of Architectural Aluminum from Shop to Site”
2. Curtain Wall Design Guide Manual, AAMA CW-DG-1, and the AAMA Metal Curtain Wall Manual
3. 501 – Methods of Tests for Exterior Walls
4. 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
5. 501.3 – Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing by Uniform Air Pressure Difference
6. 502 – Voluntary Specification for Field Testing of Windows and Sliding Glass Doors
7. 806-1 – Specification for Bonding Type Back Bedding Glazing Tapes for Use with Architectural Aluminum
8. 1503.1 – Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

C. American Society for Testing and Materials (ASTM):

1. C920 – Specification for Elastomeric Sealant Joints
2. E283 – Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen
3. E330 – Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
4. E331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
5. E783 – Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors

6. E1105 – Field Determination of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference
7. E448 – Standard Practice for Scleroscope Hardness Testing of Metallic Materials
8. E774 – Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units National Association of Architectural Metal Manufacturer's (NAAMM) Metal Finishes Manual for Architectural and Metal Product

D. Glass Association of American (GANA):

1. Glazing Manual and Sealant Manual

E. The Aluminum Association:

1. Specification for Aluminum Structures – Allowable Stress Design Specification and Commentary

F. American Society of Civil Engineers:

1. ASCE-7 – Minimum Design Loads for Buildings and Other Structures

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design and provide means to anchor the curtain wall system to the building structure. Curtain wall fabricator/installer shall provide all engineering required to fabricate, attach, and install curtain wall system to edge of slab or other construction. Connections shall be designed to deliver vertical curtain wall loads as gravity load direct to beam without introducing torsion. Minimize out-of-plane wind loading by engaging both top flange and web of spandrels.

B. General: Provide glazed aluminum curtain wall systems meeting or exceeding the following performance requirements:

1. Structural Properties Wind Loads:

a. Exterior Walls: The glazed aluminum curtain wall work, including glass, shall be designed, fabricated and installed to withstand the maximum inward and outward wind pressures as required by the building code per requirements in the Structural General Notes:

C. General Performance: Comply with performance requirements specified, as determined by testing manufacturer's standard of glazed curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed curtain walls shall withstand movements of supporting structure indicated on Drawings including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
c. Deflection exceeding specified limits.
d. Glass breakage.
e. Water leakage.
f. Air leakage exceeding specified maximum value.
g. Condensation formation on interior surfaces at thermal design conditions.
h. Other structural failure.
i. Noise or vibration created by wind and thermal and structural movements.
j. Loosening or weakening of fasteners, attachments, and other components
k. Failure of operating units.
l. Sealant failure (adhesive or cohesive).

D. Structural Loads:

1. Wind Loads: As indicated on drawings.
2. Seismic Loads: As indicated on drawings.

E. Structural-Test Performance: Provide glazed curtain walls tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Uniform Load: A static air design load of 40 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur:

G. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone applicable to the Project's locale.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 20 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft.

1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

J. Thermal Movements: Design and detail wall and its components to permit thermal movement without causing buckling; glass and glazing system damage or failure; sealant failure; excess stress on framing, anchors and fasteners; reduction of performance or other detrimental effects. Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F.

K. Seismic:

1. When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 times the story height and ultimate displacement (inelastic) of 1.5 times the design displacement.
2. When tested to AAMA 501.6, system must meet dynamic seismic drift causing glass fallout (∆Fallout) of 4" or 0.0300 times the story height.

L. Energy Performance: Glazed curtain walls shall have certified and labeled energy performance ratings according to NFRC.

1. Thermal Transmittance (U-Factor): Fixed glazing and framing assemblies shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to AAMA 1503.
2. Average Solar Transmittance: Provide glazed aluminum curtain wall systems with average solar heat gain coefficient of not more than 0.50 when modeled in accordance with NFRC 200 or physically tested in accordance with NFRC 201.
3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static- air-pressure differential of 6.24 lbf/sq. ft.
4. Condensation Resistance: Condensation Resistance: Provide curtainwall system with condensation resistance factor (CRF) of not less than 75 (Frame) and 75 (Glass) with 1/2 inch warm edge spacer and argon fill gas, when tested according to AAMA 1503.1.
    a. Design the wall and its components to not develop any visible interior condensation on framing members or glazing.
    b. Provide independent laboratory test reports based on AAMA 1503, confirming wall system performance to at least the above criteria.

c. If independent laboratory test reports are unavailable to verify thermal performance, provide computer analysis using Therm 5 and Windows 5 software as developed by Lawrence Berkeley National Laboratory. Include in the analysis at least all principle mullions for sill, jamb, and head conditions for vision lights and spandrel areas.

1.04 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition.

1. Test a minimum five production-run samples each of metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed assemblies.
3. Perform tests under environmental conditions that duplicate those under which assemblies will be installed.
4. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

1.05 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: For glazed curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed curtain walls, showing the following:

a. Details of all shapes and conditions, including intersections.
b. Joinery, including concealed welds.
c. Reinforcing.
d. Anchorage systems.
e. Integration with surrounding construction (coordinated with related trades).
f. Flashing
g. Thermal breaks.
h. Glazing and reglazing details.
i. Frame seals.
j. Water drainage details and flow diagrams; location of weeps..
k. Provisions for frame adjustability without compromising frame perimeter seals (includes inner and outer seals).
l. Provisions for expansion and contraction.
m. Isometric (three-dimensional) details of complex conditions, such as gutter splices, gutter transitions, gutter end dams, termination of sill flashing conditions, etc.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Submit 3 sets of labeled Samples of the following.

a. Typical extrusions and formed shapes, 12 inches long, with specified color and finish.
b. Include 2 or more Samples in each set, indicating limits of variation, if any, in color and finish.
c. Typical sheet, plate and panel, 6 inches square, with specified color and finish. Include 2 or more Samples in each set, indicating limits of variation, if any, in color and finish.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.

2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. Delegated-Design Submittal: For glazed curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Welding certificates.

C. Energy-Performance Certificates: For glazed curtain walls, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy-performance values for each glazed curtain wall.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed curtain walls, indicating compliance with performance requirements.

E. Preconstruction Test Reports: For glazed curtain walls and elastomeric glazing sealants, written on sealant manufacturer’s official letterhead.

1. Submit statement for structural glazing sealants, written on sealant manufacturer's official letterhead and signed by the responsible representative, indicating that structural sealants have been tested prior to installation and conform to the requirements of the Contract Documents and the following:

a. The structural sealant meets ASTM C1184.
b. The structural sealant is compatible with specified sealant backing and spacer materials as deter- mined by ASTM C1087.
c. The structural sealant is compatible with and does not adhere to specified bond breaker and spacer materials as determined by ASTM C1087.
d. The structural sealant is compatible with the insulating glass unit edge seal.
e. The structural sealant is compatible with and has been tested for adequate adhesion to each respective substrate.
f. The details of construction have been reviewed and are approved for use with the structural seal- ant.
g. The design stress of the sealant due to the application of the primary forces does not exceed 138 kPa (20 psi).

2. Submit test reports, as partial fulfillment of these requirements, from the manufacturers or an independent laboratory. Testing of structural sealants shall comply with ASTM C1021. Schedule sufficient time for the conducting of testing, certification of results and submission, to not cause a delay in the progress of the Work.

F. Maintenance Data: For glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for post installation-phase quality-control program.

G. Warranties: Sample of special warranties.

1.07 QUALITY ASSURANCE

A. Manufacturer's Qualifications: A minimum of 10 years of successful experience in the manufacture of similar glass-and-metal curtain wall systems.

B. Installer Qualifications: Minimum 5-7 years of successful experience in the installation of systems similar to those required. Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field-testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of glazed curtain walls.

F. Energy-Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide NFRC-certified, glazed curtain walls with an attached label.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Coordination." Prior to the start of the curtain wall work, and at the Contractor's direction, meet at the site and review the construction schedule, availability of materials, installers personnel qualifications, equipment and facilities needed to make progress and avoid delays, installation procedures, testing, inspecting, and certification procedures, and coordination with other work. Meeting shall include Construction Manager, Contractor, curtain wall installer, manufacturer's representative, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the curtain wall work.

H. Field Measurements: Verify actual locations of structural supports for glazed curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 COORDINATION

A. Field Measurements: If possible, verify actual locations of structural supports for glazed-aluminum curtain wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions and tolerances. The Contractor assumes full responsibility for establishing existing dimensions and meeting required tolerances and sightlines.
2. Notify Architect in writing if field measurements of structure cannot be performed prior to fabrication.
3. Notify Architect in writing if field measurements of existing construction indicate that the system will exceed any of the tolerances prescribed in "Erection Tolerances."
4. The proper alignment of the new curtain wall members is critical to the air and watertightness of the system. The Contractor bears full responsibility for performing a detailed field survey prior to issuing shop drawings and beginning fabrication. Should the Contractor need to perform remedial work to the building structure as a result of inadequate field measurements, the Owner shall not bear any additional costs.

B. Work in conjunction with the other trades employed on the project by promptly completing the work of this Section as required to meet the project schedule and so as not to impede other trades.

1. Coordinate the work of this Section with other trades so that the intent of the Drawings and Specifications is carried out.
2. Coordinate with other trades to maximize efficient use of scaffolding and staging.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Handle and protect materials in transit and stored materials from damage due to exposure to moisture, excess heat, sparks, flame, or any other cause. Replace damaged materials.

B. The Contractor is responsible for protecting all materials and equipment stored on the site.

C. All materials to be new. Place materials on pallets. Use waterproof and fireproof canvas tarpaulins (not polyethylene) to cover all stored materials top to bottom.

D. Protect all materials in original, unopened, labeled containers, and packaging and in compliance with manufacturer's directions. Comply with manufacturer's recommendations for minimum and maximum time and temperature limits for storage.

E. Promptly remove from the site all materials rejected by the Architect during transportation, storage, handling, and installation.

F. Do not stockpile materials or equipment to overload any building or site component.

G. General: Conform to the handling standards of the AAMA Aluminum Curtain Wall Manual #10, "Care and Handling of Architectural Aluminum from Shop to Site" except where more-stringent requirements are specified herein.

H. Crate curtain wall framing and trim to avoid racking, twisting, or denting. Package components for transit sufficiently to avoid any damage to finish.

I. Protect liquid components (including sealants) and all other materials from damage due to freezing or other damage due to extreme temperatures.

J. Store rolled goods on ends only. Discard rolls that have been flattened, creased, or otherwise damaged. Unroll sheets and allow them to relax prior to use.

K. Do not dilute primers, roofing cements, adhesives, coatings, or sealants. Keep containers closed, except when removing materials. Do not use equipment with remains of previous bitumens other than asphalt.

L. Dispose of debris as required by state and local ordinances.

M. Do not allow wrappers, packaging, or other miscellaneous materials to be included in the system.

1.10 WARRANTY

A. Special Assembly Warranty: Standard form in which Installer agrees to repair or replace components of glazed curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection. Failure according to that specified in "Performance Requirements."
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design: Contract Documents are based on products and systems specified to establish a standard of quality. Other named acceptable manufacturers/fabricators offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

1. Basis of Design:

a. Kawneer 1600 Wall System 2 Curtainwall

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include those indicated below.

1. Oldcastle Inc..
2. YKK AP America Inc.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.03 FRAMING MATERIALS

A. Framing Members: Manufacturer's standard formed- or extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Glazing System: 2 sided captured
2. Glazing Plane: Front.

B. Doors: Comply with Division 08 Section “Aluminum-Framed Entrances and Storefronts”

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. No exposed fastenings will be permitted in aluminum work, unless otherwise specified or indicated.

    a. In certain locations where it is impossible or highly impractical, or in locations where exposed but hidden from view, consideration will be given to exposed fastenings where such fastenings are Phillips, flat head, or countersunk machine screws matching the finish of the adjacent wall system member.

D. Anchors: Three-way adjustable anchors, with minimum adjustment of 1 inch, that accommodate fabrication and installation tolerances in material and finish and are compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials or Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

F. Framing Sealants: Manufacturer's standard sealants with VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA method 24).

2.04 GLAZING SYSTEMS

A. Glazing and glazing gaskets: Comply with Section 08 80 00 – Glazing.

1. 1600 System 2 Wall™ Curtain Wall System: Outside glazed pressure plate format with 1 inch glazed insulating glass units.

B. Glazing Gaskets, Spacers, Setting Blocks, Sealant Backings, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and assembly performance requirements.

C. Glazing Sealants: For glazed curtain walls, as recommended by manufacturer for joint type, and as follows:

1. Structural Sealant: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.

   a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   b. Color: As selected by Architect from manufacturer's full range.

2. Weatherseal Sealant: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and glazed curtain-wall manufacturers for this use.

   a. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   b. Color: Matching structural sealant.

2.05 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

B. Cleaning Agent and Cloth: As recommended by structural-sealant manufacturer.

2.06 FABRICATION

A. General: Fabricate the glazed aluminum curtain walls to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies that meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.

B. Form or extrude aluminum shapes before finishing.

C. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
6. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.
7. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed curtain wall to exterior.

E. Shop Assembly: As far as practicable, all fitting and assembly work shall be done in a fabrication shop.

1. Framing members attaching curtain wall components to building supports shall provide for 3-way adjustment to accommodate fabrication and construction tolerances, and allow for thermal and building movements.

2. Provide vents, weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior, and to avoid condensation at glass spandrel unit air spaces. Provide weep baffles secured to inside of frame behind vents and weepholes.
3. Rigidly secure nonmovement joints.
4. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
5. Preparation includes, but is not limited to, cleaning and priming surfaces.
6. Seal joints watertight unless otherwise indicated.
7. Install glazing to comply with requirements in Section 08 80 00 – Glazing.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

G. Trim and Sills:

1. Provide extruded aluminum trim, factory welded and ground smooth at corners and intersections.
2. Provide extruded aluminum sill extensions in profiles shown, with upturned end dams.
3. Caulk return legs shall be incorporated in panning die. Drive-on type caulk returns will not be acceptable.
4. Brake metal shapes will not be acceptable.
5. Minimum wall thickness shall be 0.050 inches.

2.07 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish Application:

1. Apply high performance organic coatings to all exposed exterior surfaces of glazed aluminum curtain wall components. Apply thermosetting acrylic enamel coatings to all exposed interior surfaces of glazed aluminum curtain wall components.
2. Adhesion and Compatibility Testing: Test samples of aluminum coatings on aluminum will be required for compatibility and adhesion testing of all sealants proposed for use on framing components. Refer to Section 07 92 00 – 'Joint Sealants.
3. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Coating Finish: AA-C12C42R1x and the following:

1. Polyvinylidene fluoride finish coating containing not less than 70% of "Kynar 500" or "Hylar 5000" fluorocarbon resin specially formulated for spray application to extrusions and preformed aluminum metal shapes. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish. Coating films shall be uniform and visibly free from flow lines, streaks, blisters, sags or other surface imperfections in the dry-film state on all surfaces.
2. Thickness:
    a. Fluoropolymer 2-Coat Coating System: Minimum 1.2 mil total dry film thickness (0.25 mil primer +/- 0.05 mil and 1.0 mil topcoat).
    b. Coating Performance Criteria: Meets or exceeding AAMA 2605.
3. Color: . Kawneer _____

2.08 COATINGS FOR CONCEALED METAL SURFACES

A. A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A 123.
2. Coating for Aluminum, and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and

where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

a. Bituminous Paint: Cold-applied, non-sagging, bituminous paint complying with ASTM D 1187. Apply in two coats for an overall minimum dry film thickness of 25 mils.
b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

2.09 SOURCE QUALITY CONTROL

A. Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 – EXECUTION

3.01 PREPARATION

A. Coordinate glazed aluminum curtain wall work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.

B. Place such items, including concealed overhead framing, accurately in relation to the final location of glazed aluminum curtain wall components.

3.02 EXAMINATION

A. Examine the substrates, adjoining construction, and conditions under which the Work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before beginning installation of the glazed aluminum curtain wall work examine all parts of the existing building structural frame and the existing building cladding indicated to support the glazed aluminum curtain wall work. Notify Contractor in writing, of any dimensions, or conditions, found which will prevent the proper execution of the glazed aluminum curtain wall work, including specified tolerances. Use Contractor's offset lines and bench marks as basis of measurements.

3.03 INSTALLATION

A. Comply with AAMA guide specification for window walls, and install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmoving joints.
5. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and impediments to movement of joints.
6. Perform field welding under the same requirements specified for shop welding.
7. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
8. Thoroughly clean welds and adjoining burned areas on primed surfaces and then paint the areas with priming paint of type used for shop coats, or zinc rich paint for galvanized steel.
9. Seal joints watertight unless otherwise indicated.

C. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed curtain walls to exterior.

E. Install components plumb and true in alignment with established lines and grades.

F. Install glazing as specified in Section 08 80 00 – Glazing. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

G. Pressure Plate Framing: Install glazing in accordance with Section 08 80 00, using exterior dry glazing method.

H. Perform no glazing prior to written certification of adhesion and compatibility test results, review and written approval of glazing details by glass and sealant manufacturers and acceptance of written quality assurance program.

I. Install weatherseal sealant according to Section 07 92 00 – Joint Sealants and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.04 ERECTION TOLERANCES

A. The glazed aluminum curtain wall systems shall be fabricated and erected to accommodate the dimensional tolerances of the structural frame and surrounding cladding while providing the following as installed tolerances.

1. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and other fixed elements of the structure, including variations from plumb, level, straight and member size: +/- 1/4-inch max in any 20’-0” run, column-to-column bay, or floor-to-floor height.
2. Alignment: Where surfaces abut in line, and meet at corners, limit offset from true alignment to 1/32 inch.
3. Variation from angle, or plumb, shown: +/- 1/8-inch max in any 10’-0” run or story height, non-cumulative.
4. Variation from slope, or level, shown: +/- 1/8-inch max in any 20’-0” run or column-to-column bay, non-cumulative.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of representative areas of captured glazed curtain walls shall take place as installation proceeds to determine compliance of installed assemblies with specified requirements.

1. Water Infiltration Tests:

a. Conduct tests in accordance with ASTM E 1105.
b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections. Correct all deficiencies observed as a result of this test and retest. For each unsuccessful field test, another similar sample installation area shall be selected and tested.

D. Prepare test and inspection reports.

3.06 PROTECTION AND CLEANING

A. Protect building, new construction, and existing construction scheduled to remain from all weather and damage. Replace all material damaged due to water infiltration, weather, or other causes at no additional cost.

B. Protect materials against damage and contamination. Clean surfaces as required to remove corrosive substances and other substances that may affect the appearance or operation of the system, during and at the conclusion of construction. Remove all evidence of repair and cleaning.

C. Periodically remove from the site debris, excess materials and unused tools and equipment resulting from this work. At conclusion of construction, leave premises in clean condition.

END OF SECTION

SECTION 08 52 00

ALUMINUM CLAD WOOD WINDOWS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes fixed aluminum clad wood-framed windows as complete assemblies, with factory-installed glass and glazing.

B. Functions including:

1. Inswing casement window units
2. Fixed windows

C. Related Sections:

1. Section 07 46 23 – Wod Siding for wood trim not included as part of the wood window units.
2. Section 07 62 00 – Sheet Metal Flashing.
3. Section 07 92 00 – Joint Sealants: Sealing between windows and adjacent materials.
4. Section 09 91 00 – Painting for painting on interiors other than factory-applied interior primer.

D. Procedures: The Installing Contractor, as defined in “DEFINITIONS”, Subparagraph A of this section, shall assume responsibility for site measurements, including but not limited to the coordination and maintenance of on-site masonry openings, trim openings and rough openings, in association with the approved shop drawings.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. E283 – Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
2. E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
3. E547 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
4. F588– (Windows).
5. E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

B. National Fenestration Rating Council (NFRC): 100; Procedure for Determining Fenestration Thermal Properties.

1. NFRC 100- - Determining Fenestration U-Factor.
2. NFRC 100 -- Test Procedure for Thermal Transmittance of Fenestration.
3. NFRC 200 -- Determining Fenestration SHGC & Tv.
4. ASTM E1423 - Determining Thermal Transmittance of Fenestration Systems.
5. NFRC 500 - Determining Fenestration Product Condensation Resistance.

C. American Architectural Manufacturers Association/Window and Door Manufacturers Association (AAMA/WDMA), American National Standards Institute/Window and Door Manufacturers Association (ANSI/WDMA), Canadian Standards Association (CSA)

1. AAMA/WDMA/CSA 101/I.S.2/A440-05’, 101/I.S.2/A440-08’ - Standard / Specification for Windows, Doors and Skylights.
2. WDMA I.S. 4-07’A Water Repellant Preservative Treatment for Millwork.

1.03 SYSTEM DESCRIPTION

A. Design and Performance Requirements:

1. Window units shall be designed to comply with ANSI / AAMA / NWWDA 101 / I.S.2 and 101 / I.S. 2/ NAFS-02
2. Casement Units:

a. Fixed Units: PG35
b. Air leakage shall not exceed the following when tested at 1.57 according to ASTM E 283: ≤ 0.30 cfm per square foot of frame.
c. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547: H-LC40: 6.0 psf.
d. Window assembly shall withstand the following positive or negative uniform static air pressure difference without damage when tested according to ASTM E 330: H-LC40: 60 psf.

B. Performance Requirements: As described in "Quality Assurance."

1. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS for air infiltration, water penetration, operating force and structural performance.
2. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.
3. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
4. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.
5. Design and size windows to withstand dead loads and positive and negative wind loads acting normal to plane of wall when tested in accordance with ASTM E330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum load.

    a. Main wind force design pressures are shown on Drawing Sheet S0.0

6. Deflection: Limit member deflection to flexure limit of glass with full recovery of glazing materials.
7. Air Infiltration: Limit air leakage through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
8. Water Leakage: None, when measured in accordance with ASTM E 547.
9. Air and Vapor Seal: Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product data for each type of wood window specified, including:

1. Construction details and fabrication methods.
2. Profiles and dimensions of individual components.
3. Data on specialty glazings, accessories and finishes.
4. Anchorage details.
5. Recommendations for installation, site finishing, maintenance and cleaning.

C. Shop Drawings: Include plans, elevations, sections, details, attachments to other Work, operational clearances, and details of installation, including anchor, flashing, and sealant installation and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Thermal-break details.
6. Thickness and gauges of metal.
7. Glazing details.
8. Subframe and trim details.
9. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:

    a. Structural test pressures and design pressures from basic wind speeds indicated.
    b. Deflection limitations of glass framing systems.

D. Furnish shop drawings for each window specified, as follows:

1. Unit Elevations, including:

a. Scale: 3/4 inch = 1'-0" recommended.
b. Overall dimensions for each unit (width & height) clearly indicated as required, including:

1) Masonry Openings (indicate space tolerances between masonry and frame)
2) Trim Width & Height (complete finish perimeter, as assembled or knocked down by window manufacturer).
3) Rough Opening (as recommended by window manufacturer).
4) Jamb/Frame Width & Height (unit dimension required to fit within rough opening)

c. Visible Glass Opening:

1) Per pane
2) Per sash opening

d. Total sash opening dimension.
e. Stile and rail widths (face dimensions).
f. Section references to details.

2. Section Details, including and clearly indicating the following:

a. One-half scale for typical frame/jamb/sash sections and full size for typical composite members recommended.
b. Head: Trim/Frame/Sash/Glass
c. Jamb: Trim/Frame/Sash/Glass
d. Sill Trim/Frame/Sash/Glass
e. Meeting/check rails at hung units.
f. Mullions as required (vertical Trim/Frame/Sash/Glass members between window units).
g. Sill-to-Header Mullions as required (horizontal Trim/Frame/Sash/Glass members between window units).

3. Glazing details.
4. Anchorage systems, spacing and offset dimensions shall be fully indicated.

E. Samples for Verification: For windows and components required, prepared on samples of size indicated below.

1. Window Corner Fabrication: 12--by-12-inch- long, full-size window corner including full-size sections of window frame with factory-applied color finish, seals, and glazing.

F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of wood window. Test results based on use of downsized test units will not be accepted.

G. Provide manufacturer's instructions, including:

1. Installation procedures for each type of window.
2. Prime and paint procedures for on-site touch-up.
3. Maintenance procedures for each type of window.

H. Shop drawing approvals and arrangements for all sample approvals, in coordination with the Architect, shall be the responsibility of the Installing Contractor unless otherwise specified.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations

B. Window manufacturer shall provide single source responsibility for the fabrication and assembly of all window units. Single source responsibility for all woodwork, fabricated glazing, and assembly is preferred.

C. Source Limitations: Obtain aluminum clad wood windows manufactured by a single firm, providing single-source responsibility for all components of the work.

D. Standard of Quality:

1. The specifications and drawings define and show the essential minimum requirements for quality of materials, construction, finish and overall workmanship.

2. Information on specifications and drawings establishes requirements for windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
3. Minor variations in construction techniques between manufacturers will be permitted, providing specified standards of materials, design, function, dimension, configuration, strength, quality and performance are met.

E. Installer Qualifications: An installer regularly engaged in the installation of windows, with not less than ten years of successful experience in installation of window systems in institutional projects similar to that required for this project.

F. Testing as required to meet specified window performance standards shall be the responsibility of the window manufacturer.

1. Manufacturer shall engage a qualified independent testing and inspection lab to perform testing on window unit and to prepare report.
2. Testing shall confirm that the tested window units meet the performance testing contained in “QUALITY ASSURANCE” for performance grade.

G. Safety Glass Standard: Provide the type of products indicated that comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

1. Provide safety glass permanently marked with certification label of the Safety Glazing Certification Council (SGCC). Safety glass without permanent markings may be provided when accompanied by written affidavit from the window manufacturer and/or the glass tempering vendor certifying that safety glass has been provided in accordance with Federal law. Determination of certification acceptability to the agent having jurisdiction over the end use of specified window units is the responsibility of the Installing Contractor.

H. Insulating Glass Certification: Comply with recommendations of the IGCC and SIGMA except where more stringent requirements are indicated.

I. Glazing Standards: Comply with recommendations of the Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated.

J. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Provide WDMA-certified wood windows with an attached label.

1.06 DELIVERY, STORAGE AND HANDLING

A. Identify each window unit with individual opening numbers as designated on shop drawings, using temporary, removable or concealed markings.

B. Protect windows during transit. Individual unit shipments shall be crated. Trailer loads shall be loaded and secured by the manufacturer in accordance with common carrier regulations unless otherwise specified. Shipments shall be fully insured by the manufacturer and be made F.O.B. designated point of delivery.

C. Unloading and subsequent handling at the designated point of delivery shall be the responsibility of the Installing Contractor. Claims for damages and/or missing product must be submitted by the Installing Contractor in accordance with the manufacturer's policy unless otherwise specified. For claims on products delivered via common carrier, the Installing Contractor shall initiate the claim.

D. Store window units in an upright position in a clean and dry storage area above ground and protect from weather.

1.07 FIELD MEASUREMENTS

A. Verification of Measurements: Conduct field investigation to verify individual openings in construction by accurate field measurement as required to fit the Work properly and before fabrication. Show recorded

field measurements on filed “as-builts” within three (3) weeks after project has been released to the Contractor. Furnish authenticated field measurements on shop drawings.

B. Field Measurements: Where the new products are to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

C. Recheck measurements before installing each product.

D. Site measurements, including but not limited to the coordination and maintenance of on-site masonry openings, trim openings and rough openings, in association with the approved shop drawings, shall be the responsibility of the Installing Contractor.

1.08 PROJECT CONDITIONS

A. Preparation and maintenance of the site and the provisions for all labor and materials required to successfully install windows shall be the responsibility of the Installing Contractor unless otherwise specified.

1. Conditioning: Windows shall not be delivered or installed until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to the projects geographical location.
2. Fasteners, sealants and other materials required to successfully complete the window installation, which are not specified and supplied by the window manufacturer, shall be the responsibility of the Installing Contractor.

1.09 SCHEDULES

A. Production and Delivery Schedules: Production and delivery schedules shall be determined by the window manufacturer within 10 working days of submission, from the Installing Contractor to the window manufacturer, of all approved shop drawings and approved sample submittals.

1.10 WARRANTY

A. Wood Window Warranty: Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace, at the manufacturer's discretion, units that fail in materials or workmanship within the specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure to meet performance requirements.
    b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
    c. Deterioration of wood, metals, vinyl, other materials, and finishes beyond normal weathering.
    d. Failure of insulating glass.

B. Warranty Period:

1. Windows: 20 years from the date of manufacture.
2. Insulating Glass: 20 years from the date of manufacture.
3. Factory Applied High Performance Organic Coatings (PVDF): Submit written warranty for a period of twenty (20) years.

C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the contract documents.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Marvin Inc., Warroad, MN

1. Windows are based on Ultimate Casement Inswing and Fixed Windows.

B. Subject to compliance with requirements, provide the “Basis of Design” product or a comparable product by one of the following manufacturers:

1. Kolbe & Kolbe. Ultra Clad Casement
2. JELD-WEN Windows and Doors; Klamath Falls, OR

C. Design Concept: The drawings indicate window sizes, molding profiles, dimensional requirements, materials, appearance, and performance capacities of window units. Minor dimension and profile adjustments to those shown may be made in the interests of fabrication or erection methods or techniques, weatherability factors, and the ability of the design to satisfy the design requirements, provided the visual design concept (general profile and shape, location of framing members, plane of glazing, and dimension points) are maintained and such adjustments are approved by the Architect at time of shop drawing review.

2.02 MATERIALS

A. Wood: Clear ponderosa pine, mixed grain fir, or another suitable fine-grained lumber; kiln dried to a moisture content of no greater than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated in accordance with I.S.4

B. Frame Description:

1. Frame thickness: 11/16 inch head jamb, 1-11/32 inch composite side jamb, 1-7/16 inch sill, 8 degree bevel.
2. Frame width: 4-9/16 inches. Exterior extruded aluminum clad 0.050 inch thick.
3. Clearances and Shim Spacing: Minimum required for installation and dynamic movement of perimeter seal. Refer to drawings for requirements.

C. Sash Description:

1. Composite sash thickness: 1-7/8 inches for stationary units. Corners slot and tenoned.
2. Sash exterior extruded aluminum clad 0.050 inch thick.

D. Exterior Trim:

1. Nailing Fin and Drip Cap: Integral extruded aluminum on all four sides of frame.
2. Factory Applied Casing Options: Extruded Aluminum Brickmould.

E. Factory Applied Extension Jambs: Provide on all four sides of frame interior.

F. Aluminum Extrusions for Cladding: Manufacturer's standard formed sheet or extruded-aluminum cladding, mechanically bonded to exterior exposed wood members. Provide aluminum alloy and temper recommended by wood window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, and not less than 16,000-psi minimum yield strength.

1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

G. Clad Trim and Glazing Stops: Hollow extrusions; finish to match clad frame members.

1. Factory- Installed Casing Profile: Profile shown on the drawings.

H. Glass and Glazing Materials: Glass: Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 774. As follows:

1. Insulated Glass: Clear, insulating-glass units, with low-E coating pyrolytic on second surface or sputtered on second or third surface. Provide argon gas filled units.
2. All insulated glass with sealed edges shall be set in rabbeted sash from the interior sash face, permanently sealed to the exterior of the sash rabbet in silicone and fixed in place with wooden glazing stops set from the interior.
3. Insulated Glass Thickness: 3/4-inch nominal.

I. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with wood window members, cladding, trim, anchors, and other components.

J. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

K. Sealant and Backing Materials: As specified in Section 07 92 00.

2.03 FABRICATION

A. General: Fabricate wood window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.

1. Comply with requirements of NWWDA I.S. 2 for moisture content of lumber at time of fabrication.

B. Fabricate windows to produce units that are reglazable without dismantling sash framing. Provide openings and mortises precut, where possible, to receive other items.

1. Provide units with jamb extensions where required for wall thickness.
2. Provide units with window screens.
3. Provide glazing stops, nailed or snap-on type, coordinated with glass selection and glazing system indicated.
4. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units.
5. Factory-Glazed Window Units: Except for light sizes in excess of 100 united inches, glaze window units in the factory.

C. Simulated Divided Lites (SDL):

1. Exterior Muntins:

a. Material: Extruded aluminum permanently applied to exterior of insulating glass unit.
b. Pattern: See drawings
c. Width: As detailed.
d. Finish: Match exterior cladding

2. Internal Shadow Bar: Bronze
3. Interior Muntins:

a. Material: Clear pine permanently bonded to interior of insulating glass unit.
b. Width: Match exterior muntin

D. Complete fabrication, assembly, finishing, and other work before shipment to the Project site, to the maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Fixed Windows: Sash set

1. Fixed sash shall be setup in jamb/frame types as consistent in design and shape.
2. Fixed sash shall be fixed in place with removable stops or permanently attached to the jamb/frame with stainless steel screws.

2.04 MISCELLANEOUS MATERIALS

A. Spray Foam insulation: Minimal expanding, low compression, closed cell foam and compliant with ASTM E2112-07, sec. 5.9.2. Provide product from one of the following as acceptable to the window manufacturer:

1. Great Stuff Pro Window & Door (www.greatstuff.dow.com),
2. Pur Fill 1G (www.todol.com)
3. Touch n' Seal Window & Door Sealant (www.touch-n-seal.com)

2.05 FINISHES

A. Exterior cladding of windows shall be factory finished custom color.

B. Clad Finish: High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color: As selected.

C. Interior Wood Finish: Provide the following finish on exposed wood in units:

1. Provide manufacturer’s standard shop-prime coat on interior wood surfaces for window units indicated. Provide wood unfinished where interior finish is to be stained and finished. Refer to drawings.
2. Apply finish painted coating system in accordance with Finish Schedule and in Section 09 91 00 – Painting.

PART 3 – EXECUTION

3.01 PREPARATION

A. Install membrane flashing at sills, mullion covers and other locations indicated.

1. Comply with membrane manufacturer’s recommendations and details for the installation and substrate indicated.
2. Adhere perimeters of membrane using the manufacturer’s recommended adhesive tape and/or mechanical fasteners, and seal all edges subject to moisture infiltration behind the membrane, with the manufacturer’s recommended cap or water-block seal.
3. Form sheet metal sill pan in accordance with manufacturer’s recommendations.
4. Provide a shingle style lap joint whereby upper flashing membrane overlaps onto lower membrane flashing installation, direction moisture to the exterior. Provide weeps to drain water to exterior of window. Seal as specified.

B. The Installing Contractor shall comply with “Delivery Storage and Handling” and “Project Conditions”.

C. Coordinate with masonry openings, trim openings and rough openings, in association with the approved shop drawings.

D. Prepare windows for installation in accordance with manufacturer’s recommendations.

3.02 INSPECTION

A. Inspect openings before beginning installation. Verify that the opening is correct and all existing deviations from plumb, level and square opening noted. Do not proceed with the installation of the window units until unsatisfactory conditions have been corrected.

1. Masonry surfaces shall be dry and free from excess mortar, sealant, and other construction debris.
2. Coordinate window installation with all flashing, seals, trim, and other built-in components.

3.03 INSTALLATION

A. General: Install windows in accordance with manufacturer’s installation guidelines and recommendations per approved shop drawings, in proper relation to adjoining construction. Do not twist frames or force fit them into poorly prepared openings. Anchor windows to satisfy design requirements.

B. Comply with the window manufacturer's recommended installation instructions, including but not limited to the following:

1. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, and without warp or rack of jamb/frame, sash or glazing, centered in masonry opening to minimize variations in trim installation.
2. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

3. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
4. Provide proper support and anchor units securely in place to structural support, and in proper relation to adjacent construction.
5. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action. (dissimilar materials, treated lumber, etc.) at the points of contact with other materials.
6. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.
7. Seal head trim/jamb and sill members of window to exterior wall with sealant and related backing materials at perimeter of assembly leaving a uniform sealant recess on all four sides of the window.

3.04 FIELD QUALITY CONTROL

A. The manufacturer shall have a factory representative on site at the start of installation. The window installation shall not begin until the representative has discussed proper methods and procedures with the Contractor and has witnessed the installation of the first window.

B. The factory representative shall also visit the site at least once during installation but no less than every other month and shall also review the work at the completion of the entire installation.

C. The factory representative shall advise the Contractor of any corrections required and provide the Architect a written report of his observations.

D. The Owner will engage the services of a qualified independent testing and inspecting agency to perform field testing and inspections and to prepare reports.

1. Testing of windows will be for the Performance Grade standards listed in “Performance Requirements.” Windows may be chosen randomly and in any number for testing.
2. Testing shown to reveal that window units meet the testing criteria will be paid for by the Owner. Testing reports that window units do not meet the specified testing criteria will be paid for by the Contactor.
3. Window units found not in compliance with standards specified here will be removed, and replaced with new units meeting performance requirements, and reinstalled at the Installing Contractor’s expense.

3.05 CLEANING

A. Clean interior and exterior surfaces promptly after installation and on-site finishing. Take care to avoid damage to protective coatings and finishes. Remove excess sealant, mortar, plaster, dirt, grease and other substances.

B. Clean glass of preglazed windows promptly after installation and on-site finishing. Do not scratch glass with cleaning tools. All glass, especially heated treated or tempered glass, can be easily scratched by certain cleaning compounds and cleaning devices. Do not use solvents that damage or deteriorate the finishes, glazing, glazing compounds or insulating glass sealants.

3.06 PROTECTION

A. Take necessary precautions to protect window units from damage or deterioration until time of substantial completion of the contract.

B. Remove and replace glass that has been broken, chipped, cracked, abraded or damaged until time of substantial completion of the contract.

C. Execute any warranty work qualifying with the window manufacturer's published warranty until time of substantial completion of the contract.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Related Sections:

1. Section 08 14 33 – Stile and Rail Wood Doors – Door preparation for hardware.
2. Division 28 Sections: Security and access control devices and system requirements and interface with hardware components of this section.

1.02 COORDINATION

A. Coordinate work of this Section with other directly affected Sections, informing manufacturer of any internal door reinforcement required for door hardware.

1. This project requires close coordination with the door manufacturer/fabricator.
2. Provide all hardware items and accessories required to fully complete the project hardware requirements for this project and provide fully functional and operational door hardware system.
3. A coordination meeting for the electrical contractor and the hardware supplier is required prior to the creation of shop drawings on projects that require card readers or similar electronic access control devices.

1.03 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data: For each product indicated.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
3. Content: Include the following information:
    a. Identification number, location, hand, fire rating, and material of each door and frame
    b. Type, style, function, size, label, hand, and finish of each door hardware item.
    c. Manufacturer of each item.
    d. Fastenings and other pertinent information.
    e. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    f. Explanation of abbreviations, symbols, and codes contained in schedule.
    g. Mounting locations for door hardware.
    h. Door and frame sizes and materials.
    i. Furnish description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

j. Provide opening specific wiring diagrams including riser diagram and point to point diagram showing all wiring terminations needed for all electrified hardware systems. Furnish elevation drawings and operation narratives for each electrified opening.

k. Furnish necessary diagrams, schematics, voltage and amperage requirements for all electromechanical devices or systems as required by related trades.

l. List of related door devices specified in other Sections for each door and frame.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared by or under the supervision of an Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.

F. Templates: The hardware supplier shall provide necessary templates to door and frame manufacturers in order to prepare their materials or product to receive the hardware items. When factory installation if required, ship prepaid to the manufacturer.

G. Samples: Submit samples of exposed door hardware for each type indicated below, in specified finish. Tag with full description for coordination with the Door Hardware Schedule.

1. Door Hardware: As follows:

a. Locks and latches.
b. Operating trim.
c. Wall stops.
d. Floor stops.

2. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

H. Warranties: Special warranties specified in this Section.

I. Operation & Maintenance Manual: Include the following:

1. Point-to-Point Systems wiring diagrams.
2. Operation Narratives for each opening.
3. Elevation Drawings for each opening showing actual locations.

1.04 QUALITY ASSURANCE

A. Door Hardware Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity which is not more than a half day of travel from the jobsite and who employs a qualified Architectural Hardware Consultant or equivalent experience available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
2. Supplier recognized by manufacturers to be a direct factory-authorized distributor of the specified hardware products.
3. Supplier is required to be available for onsite meetings with one days' notice regarding issues that arise with opening functions, installation, keying, on-site warehousing, trouble shooting of products, and final punch out related issues.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC) and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

C. Installer Qualifications: Hardware Installers must have a minimum of five (5) years' experience in installation of hardware. Provide verification of installer's qualification to Architect for approval. All installers to attend review meetings with the hardware distributor.

1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

D. Finish hardware specified in this Section shall meet the standards of the American National Standards Institute, Inc., which is sponsored by the Builders' Hardware Manufacturers Association, Inc. (BHMA). The standards latest revision will be in effect.

1. Standard: Comply with BHMA A156 series standards, Grade 1.

E. Source Limitations: Obtain each type and variety of door hardware from the single manufacturer specified, unless otherwise indicated. Obtain electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Coordination. In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Coordination. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

H. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware which fail in materials or fabrication within warranty period. Warranty period are from date of Substantial Completion as follows:

1. Failures include, but are not limited to, the following:

   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of operators and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three (3) years from date of Substantial Completion, except as follows:

1.08 Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer’s published listings.

1. Mechanical Warranty:

   a. Locks: 10 year
   b. Exit Devices: 10 year
   c. Closers: 25 year

1.09 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Contract Completion, provide six months’ full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 – PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer’s products.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2.03 MATERIALS

A. Fabrication

B. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.

C. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.

D. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

E. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

F. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.04 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Ives 5BB series

2. Acceptable Manufacturers and Products:

   a. Hager BB1191/1279 series
   b. McKinney TB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:

   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.

7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.05 CONTINUOUS HINGES

A. Manufacturers:
    1. Scheduled Manufacturer:
        a. Ives
    2. Acceptable Manufacturers:
        a. Select
        b. Roton

B. Requirements:
    1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
    3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
    5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
    6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
    7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.06 FLUSH BOLTS

A. Manufacturers:
    1. Scheduled Manufacturer:
        a. Ives
    2. Acceptable Manufacturers:
        a. Burns
        b. Trimco

B. Requirements:
    1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Schlage L9000 series

2. Acceptable Manufacturers and Products:

   a. No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-3/5-inch x 3/5 inch with 180-degree visibility. Provide messages color-coded using ANSI Z535 Safety Red with full text and/or symbols, as scheduled, for easy visibility. When applicable allows for lock status indication on both sides of the door.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:

   a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

   a. Lever Design: LATN

2.08 EXIT DEVICES – BAR TYPE

A. Manufacturer and Product:

1. Scheduled Manufacturer:

   a. Von Duprin 55/88 series

2. Acceptable Manufacturers and Products:

   a. Corbin-Russwin ED7000/ED3000 series
   b. Sargent 90 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide bar type exit devices, cast or forged of brass, bronze, or stainless steel, plated to standard architectural finishes to match balance of the door hardware.

4. Latch Bolt Throw: 3/4 inch (19 mm) for rim and mortise devices, 5/8 inch (16 mm) for surface and concealed vertical rod devices.
5. Mechanism Case: One piece without cover plate. Mount flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
6. Provide UL labeled fire exit devices for fire rated openings.
7. Provide manufacturer's standard strikes.
8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Provide electrified options as scheduled in the hardware sets.
11. Furnish all necessary wood door kits and cover plates, for proper installation of exit device.
12. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.09 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Von Duprin 22 series

2. Acceptable Manufacturers and Products:

   a. Precision Reliant 5000 series
   b. Sargent 20 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide deadlatching feature for security and for future addition of alarm kits or other electrical requirements.
4. Provide manufacturer's standard strikes.
5. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
6. Mechanism Case: Mount flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
7. Provide non-fire-rated exit devices with hex key dogging.
8. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
9. Provide UL labeled fire exit devices for fire rated openings.
10. Field drill weep holes per manufacturer's recommendation for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
11. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.10 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Schlage Everest 29 T

2. Acceptable Manufacturers and Products:

   a. No Substitute

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
    a. Patented Restricted: cylinder with interchangeable core with patented, restricted keyway.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
4. Nickel silver bottom pins.

2.11 KEYING

A. Scheduled System:

1. New factory registered system:
    a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
    a. Replaceable Construction Cores.
        1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
            a) 3 construction control keys
            b) 12 construction change (day) keys.
        2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
    a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
        1) Master Keying system as directed by the Owner.
    b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
    c. Provide keys with the following features:
        1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
        2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
    d. Identification:
        1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
        2) Identification stamping provisions must be approved by the Architect and Owner.
        3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
        4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
        5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
    e. Quantity: Furnish in the following quantities.
        1) Permanent Control Keys: 3.
        2) Master Keys: 6.
        3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
        4) Key Blanks: Quantity as determined in the keying meeting.

2.12 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. LCN 4050A series

2. Acceptable Manufacturers and Products:

   a. Falcon SC70A series
   b. Norton 7500 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. LCN 1450 series

2. Acceptable Manufacturers and Products:

   a. Falcon SC80A series
   b. Norton 8000 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-3/8-inch (35 mm) diameter with 5/8-inch (16 mm) diameter pinion journal diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Pressure Relief Valve (PRV) Technology: Not permitted.
7. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

    a. Burns
    b. Trimco

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Ives

2. Acceptable Manufacturers:

    a. Burns
    b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

    a. Glynn-Johnson

2. Acceptable Manufacturers:

    a. Rixson
    b. Sargent

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Ives

2. Acceptable Manufacturers:

    a. Burns
    b. Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Zero International

2. Acceptable Manufacturers:

    a. Reese
    b. Legacy

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.19 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Ives

2. Acceptable Manufacturers:

    a. Burns
    b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 BARN DOOR HARDWARE

A. Manufacturers:

1. Scheduled Manufacturer:

    a. Schlage

2. Acceptable Manufacturers:

    a. Häfele
    b. KN Crowder

B. Requirements:

1. Provide complete sets of sliding door hardware as recommended by manufacturer for door type and weight.
2. Include track, channels, brackets, hangers, fasteners, guides, pulls, stops, and other hardware as required for complete installation.

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

B. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.

C. Field modify and prepare existing doors and frames for new hardware being installed.

D. When modifications are exposed to view, use concealed fasteners, when possible.

E. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

1. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
2. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
3. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Installation Guide for Doors and Hardware: DHI TDH-007-20
2. Standard Steel Doors and Frames: ANSI/SDI A250.8.
3. Custom Steel Doors and Frames: HMMA 831.
4. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

L. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

B. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.

C. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

D. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

E. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

HARDWARE GROUP NO. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	PUSH PLATE	8200 4" X 16"	BLK	IVE
1	EA	PULL PLATE	8305 8" 4" X 16"	BLK	IVE
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	BLK	IVE
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	WALL STOP	WS406/407CVX	BLK	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 02

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	PUSH PLATE	8200 4" X 16"	BLK	IVE
1	EA	LONG DOOR PULL	9264F 36" 20" O	BLK	IVE
1	EA	OH STOP & HOLDER	100H	BLK	GLY
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 03

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	711	IVE
2	EA	PUSH BAR	9100HD-A	BLK	IVE
2	EA	LONG DOOR PULL	9264F 36" 20" O	BLK	IVE
2	EA	OH STOP & HOLDER	100H	BLK	GLY
2	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
2	EA	MOUNTING PLATE	4050A-18PA	693	LCN
2	EA	BLADE STOP SPACER	4050A-61	693	LCN

HARDWARE GROUP NO. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 LATN L583-363 OS-OCC	622	SCH
1	EA	SURFACE CLOSER	1450 REG OR PA AS REQ FC	693	LCN
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	BLK	IVE
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	WALL STOP	WS406/407CVX	BLK	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE GROUP NO. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T LATN L583-363	622	SCH
1	EA	FSIC CORE	23-030 EV29 T	622	SCH
1	EA	WALL STOP	WS406/407CVX	BLK	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	CLASSROOM LOCK	L9070T LATN	622	SCH
1	EA	FSIC CORE	23-030 EV29 T	622	SCH
1	EA	SURFACE CLOSER	1450 REG OR PA AS REQ FC	693	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	WALL STOP/HOLDER	WS40	613	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5	FBLK/631	IVE
1	EA	STOREROOM LOCK	L9080T LATN	622	SCH
1	EA	FSIC CORE	23-030 EV29 T	622	SCH
1	EA	SURFACE CLOSER	1450 REG OR PA AS REQ FC	693	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	WALL STOP	WS406/407CVX	BLK	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 08

Provide each PRL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	FBLK/631	IVE
2	EA	MANUAL FLUSH BOLT	FB358/FB458 (AS REQ'D)	BLK	IVE
1	EA	DUST PROOF STRIKE	DP2	BLK	IVE
1	EA	STOREROOM LOCK	L9080T LATN	622	SCH
1	EA	FSIC CORE	23-030 EV29 T	622	SCH
2	EA	OH STOP & HOLDER	100H	BLK	GLY
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	BLK	IVE
1	EA	ASTRAGAL	OVERLAPPING ASTRAGAL BY DR. MANUFACTURER *PROVIDE TYPE AS REQ'D TO PROVIDE LATCH PROTECTION		B/O
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 09

Provide each PRL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	FBLK/631	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	693	VON
1	EA	PANIC HARDWARE	LD-22-EO	622	VON
1	EA	PANIC HARDWARE	LD-22-NL	622	VON
1	EA	RIM CYLINDER	20-057 ICX	622	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (BLOCKING RING AS REQ'D)	622	SCH
2	EA	FSIC CORE	23-030 EV29 T	622	SCH
2	EA	OH STOP & HOLDER	100H	BLK	GLY
2	EA	SURFACE CLOSER	1450 REG OR PA AS REQ FC	693	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	BLK	IVE
2	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	PANIC HARDWARE	55-EO-SNB	622	VON
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	RAIN DRIP	142BK	BK	ZER
1	SET	GASKETING	429BK-S	BK	ZER
1	EA	DOOR SWEEP	8198BK	BK	ZER
1	EA	THRESHOLD	65BK	BK	ZER

DOORS REQUIRE SPECIAL 3/8 INCH UNDERCUT FOR ADA TYPE THRESHOLD.

HARDWARE GROUP NO. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1WT 4.5 X 6 *COORDINATE HINGE WIDTH WITH TRIM/SIDING DETAIL	FBLK/631	IVE
1	EA	PANIC HARDWARE	55-EO-SNB	622	VON
1	EA	LONG DOOR PULL	9264F 36" 20" O	BLK	IVE
1	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	BLK	IVE
1	EA	RAIN DRIP	142BK	BK	ZER
1	SET	GASKETING	429BK-S	BK	ZER
1	EA	DOOR SWEEP	8198BK	BK	ZER
1	EA	THRESHOLD	65BK	BK	ZER

DOORS REQUIRE SPECIAL 3/8 INCH UNDERCUT FOR ADA TYPE THRESHOLD.

HARDWARE GROUP NO. 12

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	711	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	693	VON
1	EA	PANIC HARDWARE	55-EO-SNB	622	VON
1	EA	PANIC HARDWARE	55-NL-110MD-SNB	622	VON
1	EA	RIM CYLINDER	20-057 ICX	622	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (BLOCKING RING AS REQ'D)	622	SCH
2	EA	FSIC CORE	23-030 EV29 T	622	SCH
2	EA	LONG DOOR PULL	9264F 36" 20" O	BLK	IVE
2	EA	OH STOP & HOLDER	100H	BLK	GLY
2	EA	SURFACE CLOSER	4050A REG OR PA AS REQ	693	LCN
2	EA	MOUNTING PLATE	4050A-18PA	693	LCN
2	EA	BLADE STOP SPACER	4050A-61	693	LCN
1	EA	RAIN DRIP	142BK	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8198BK	BK	ZER
1	EA	THRESHOLD	65BK	BK	ZER

DOORS REQUIRE SPECIAL 3/8 INCH UNDERCUT FOR ADA TYPE THRESHOLD.

PERIMETER WEATHER SEALS PROVIDED BY ALUMINUM SECTION.

HARDWARE GROUP NO. 13

Provide each BD door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SLIDING DOOR ADPTR	SD10 TRACK ADAPTER	622	SCH
2	EA	SLIDING DOOR HDWR	SD10-8.0 TOP MOUNT	622	SCH
2	EA	LONG DOOR PULL	9266F 36" O	BLK	IVE
2	EA	FLUSH PULL	950	622	IVE

HARDWARE GROUP NO. 14

Provide each RU door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

ALL REQUIRED HARDWARE BY OVERHEAD DOOR MANUFACTURER

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes glass and glazing for the following applications, including those specified in other Sections where glazing requirements are specified by reference to this Section.

1. Glazed curtain wall assemblies
2. Glazed entrances and storefronts.
3. Interior glazing

B. Related Sections:

1. Section 08 11 00 – Metal Doors and Frames
2. Section 08 14 33 – Stile and Rail Wood Doors
3. Section 08 41 13 – Aluminum-Framed Entrances and Storefront
4. Section 08 44 13 – Glazed Aluminum Curtain Walls

1.02 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.03 DESIGN REQUIREMENTS

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, and wind load and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 degrees F and from a consequent temperature range with glass and glass framing members of 180 degrees F.

B. Glass Design: Provide glass lites in the thickness and strengths (annealed or heat-treated) to meet or exceed the following criteria based on analysis of Project loads and in-service conditions.

1. Minimum glass thickness of lites composed of annealed or heat-treated glass are selected so the worst-case probability of failure does not exceed the following:

a. Eight (8) lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action.
b. One (1) lite per 1000 for lites set over 15 degrees off vertical and under action of wind or snow.
c. Specified Design Wind Loads: As indicated on the Structural Drawings
d. Specified Design Snow Loads: As indicated on the Structural Drawings, but not less than snow loads applicable to Project, required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7, "Snow Loads.

e. Minimum Glass Thickness for Exterior Lites: Not less than 6mm
f. Thickness of Tinted and Heat-Absorbing glass: Provide the same thickness of each tint color indicated throughout Project.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. Center-of-glass U-values: NFRC 100 methodology using LBL-35298 WINDOW 5.2 computer program, expressed as BTU/sq ft x h x deg F (W/sq. m x K).
2. Center-of-glass solar heat gain coefficient: NFRC 200 methodology using LBL-35298 WINDOW 5.2 computer program
3. Solar Optical Properties: NFRC 300.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Design Data: Submit glass manufacturer's analysis demonstrating compliance with requirements for wind load, thermal stresses, snow loads (where applicable), and center deflection.

1. Identify each glass type as listed in Part 4 of this Section and the maximum design wind load it can accommodate.
2. Each glass type shall indicate glass thickness and whether glass is annealed, heat-strengthened or tempered.
3. Submit energy calculations indicating that selected glass meets or exceeds the specified U-value requirements for both glazing and overall assembly performance, including opaque spandrel glazing.

C. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1. Low-emissivity coating, including data and table on performance criteria verifying compliance with this specification.
2. Interlayer for laminated glass.
3. Translucent frit glass of each type required. (Dot pattern and solid frit). Samples: Submit 12-inch square representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

D. Shop Drawings:

1. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
2. Glazing Instructions: Submit detailed instructions for the installation of glass. Instructions and explanatory details shall include the following:

a. Sequence of installation, including cleaning procedures and priming (if required).
b. Method of installation, including list of glazing materials
c. Location of specific items, such as the setting blocks and any special instructions as may be required.

E. Samples for Initial Selection: Submit spandrel glass manufacturer's actual color samples showing full range of standard colors available. Submit fritted glass with translucent dot patterns at 40%, 50% and 60% coverage for selection.

F. Samples for Verification: Submit 12 inch square samples, including edge condition for exposed glass panels. Glass products listed below form the basis of design. Architect may require additional samples with manufacturer's standard product line in order to satisfy design intent.

1. Insulating glass units (IGU).
2. Insulating glass units (IGU) with both translucent dot pattern and a solid translucent frit.
3. Interlayer for laminated glass.

1.05 INFORMATIONL SUBMITTALS.

A. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

B. Qualification Data: For installers.

C. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

D. Product Test Reports: For each of the following types of glazing products:

1. Coated float glass.
2. Fire-resistive glazing products.
3. Insulating glass.
4. Glazing sealants.
5. Glazing gaskets.

E. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1. Coated Glass: Manufacturer's 10-year warranty.
2. Insulating Glass: Manufacturer's 10-year warranty.

1.06 QUALITY ASSURANCE

A. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or in referenced standards.

1. NGA Publications:

a. GANA Glazing Manual (2023)
b. Laminated Glazing Reference Manual (2019)

B. Safety Glazing Standard: Provide type of products which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of Insulating Glass Certification Council (IGCC).

E. To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and conditions of glass indicated and composed of primary glass obtained from a single source for each type and class required.

F. Preconstruction Compatibility and Adhesion Testing: Submit samples of all glass, gaskets, glazing accessories and glass framing members proposed for use in contact with, or proximity of, glazing sealants, to sealant manufacturer for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods and the following requirements:

1. Submit each type and finish of glass framing member and of each type, class, kind, condition and form (monolithic, laminated, insulating units) of glass for adhesion testing and one sample of substrates (gaskets, setting blocks and spacers) for compatibility testing.
2. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.
3. Investigate materials failing compatibility or adhesion tests and obtain sealant manufacturer's written recommendations for corrective measure, including use of specially formulated primers.

G. Installation: Performed only by experienced glaziers.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Protect glass and glazing materials during delivery, storage, and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, and from other causes.

1. Handle and install glass in accordance with guidelines set forth in the NGA GANA Glazing Manual.

B. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

C. Deliver glass with manufacturer's labels intact. Do not remove labels until glass has been installed.

D. Deliver glazing compounds and sealants in manufacturer's unopened labeled containers.

1.08 PROJECT CONDITIONS

A. Field verify measurements and conditions of installation.

B. Examine all details. Provide proper fitting to details indicated.

C. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 degrees F (4.4 degrees C).

D. Protect work from damage during and after installation until project acceptance.

1.09 WARRANTY

A. Glass Installation: Submit installer's written warranty agreeing to repair or replace glass and glazing which fails to remain weathertight within five years of the date of acceptance of the work. warranty shall include sealants within the installation.

B. Manufacturer’s Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed b0y insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Contract Completion.

PART 2 – PRODUCTS

2.01 ACCEPTABLE GLASS MANUFACTURERS

A. Primary Glass; provide products from one of the following:

1. Pilkington North America, Toledo, OH
2. Viracon, Owatonna, MN
3. Vitro Architectural Glass, Cheswick, PA
4. Guardian Industries, Carleton, MI

2.02 GLASS PRODUCT STANDARDS

A. General: Unless indicated otherwise, reference numbers used throughout this Specification Section are from ASTM C 1036 and C 1048. When the end product involves one or more categories, both, the primary glass specifications and the specifications of the additional features or construction shall be met.

2.03 GLASS PRODUCTS

A. Annealed Float Glass (Clear): ASTM C1036, Type I (transparent glass flat), Class 1 (Clear), Quality q3 (glazing select) except as noted otherwise.

B. Heat-Treated Glass: ASTM C1048, Kind as indicated below, Condition A (uncoated surfaces) or Condition C (other coated glass), Type I (transparent glass flat), Class 1 (Clear), Quality q3 (glazing select); and the safety criteria of ANSI Z97.1-1975 and the CPSC 16 CFR 1201.

1. Heat Strengthened as scheduled: Kind HS; surface compression values shall not exceed 7,500 psi.
2. Full Tempered as scheduled: Kind FT; minimum surface compression shall be 10,000 psi.
3. Coated Glass: Low-emissivity coating as hereinafter specified.
4. Fabrication Process: Use horizontal oscillating roller hearth process with roll-wave distortion parallel to bottom edge of glass as installed to limit ream, strings and distortions after treatment to 1/2 acceptable under ASTM C1036.

C. Insulating Glass: Factory assembled low "E" units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, complying with requirements of IGCC other requirements specified:

1. Dual-Seal, panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for glass characteristics, air, space, sealing system, sealant, space material, and desiccants.

    a. Total Unit Thickness: 1 inch.
    b. Thickness of Each Pane: 1/4 inch
    c. Air Space Thickness: 1/2 inch

2. Exterior Pane of Glass: Clear tempered glass with low-emissivity coating on #2 surface except as scheduled.
3. Interior Pane of Glass: Clear and tempered glass where scheduled.
4. Sealing System: Provide unit edge seals meeting requirement of ASTM E 773, with aluminum spacers having mitered corners and silicone sealant for glass-to-spacer seals. Manufacturer's standard dual seal, with polyisobutylene and silicone polyisobutylene and hotmelt butyl polyisobutylene and polyurethane primary and secondary.

    a. Desiccant: Manufacturer's standard.
    b. Either Molecular Sieve or Silica Gel or blend of both.
    c. Spacer Material: Manufacturer's standard metal, with anodized finish.

5. Factory glazing shall be in accordance with manufacturer’s standard requirements. Glass shall be factory-labeled. Non-labeled glass will be rejected.
6. Glazing materials shall be compatible with aluminum and those sealants and sealing materials used in the composite structure which have direct contact with the gasket.
7. Standard exterior and interior glazing gaskets shall be a dry glazed elastomer in accordance with ASTM C509-91.

2.04 STOREFRONT AND CURTAIN WALL INSULATED VISION-GLASS UNITS

A. Low-Emissivity Coating: Low-emissivity coated glass produced by sputter coating technology applied in a vacuum chamber. Coating shall be applied to the #2 surface. Low-emissivity coated glass shall meet the following performance values; values listed have been based on Viracon (Basis of Design) VE1-2M (clear outboard and inboard glass) as indicated below.

B. Procedures as determined by Architect’s approval, meeting both performance and aesthetic values.

C. Basis of Design Vision Glass: Low-e coated, clear insulating glass: (“VE1-2M,”by Viracon)

1. Overall unit Thickness: 1 inch
2. Outdoor Lite: Heat-strengthened float glass:

    a. Thickness: 1/4 inch
    b. Low-E Coating: Coating on second (#2) surface

3. Interspace Content: Air

    a. Thickness: 1/2 inch

4. Indoor Lite: Heat-strengthened clear float glass:

    a. Thickness: 1/4 inch

5. Visible Light Transmittance: 70 percent
6. Winter Nighttime U-Factor: 0.29 Btu/(hr x sq ft x ºF)
7. Summer Daytime U-Factor: 0.26 Btu/(hr x sq ft x ºF)
8. Reflectance (Exterior): 11 percent
9. Reflectance (Interior): 12 percent
10. Shading Coefficient: 0.44
11. Solar Heat Gain Coefficient: 0.38 maximum
12. LSG: 1.84
13. Provide safety glazing labeling.

D. Solarban 60 by PPG Industries.

1. Visible Light Transmittance: 70 percent.
2. Winter Nighttime U-Factor): 0.29.
3. Reflectance (Exterior): 11 percent.
4. Shading Coefficient: 0.44.
5. Solar Heat Gain Coefficient: 0.38.

E. SN-68 by Guardian Industries.

1. Visible Light Transmittance: 68 percent.
2. Winter Nighttime U-Factor: 0.29.
3. Reflectance (Exterior): 10 percent.
4. Shading Coefficient: 0.43.
5. Solar Heat Gain Coefficient: 0.37.

2.05 INTERIOR GLASS

A. Interior Glass Types:

1. Interior Glass Type: Minimum 6 mm thick clear, tempered safety glass.

2.06 GLAZING MATERIALS AND ACCESSORIES

A. Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and uses.

B. Glazing Sealants and Compounds:

1. Provide glazing sealants of color indicated, when not indicated as selected by Architect from manufacturer's standard colors. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
2. Exterior Glazing: One part silicone rubber glazing sealant, complying with ASTM C920, non-sag. Provide acid type recommended by manufacturer where only non-porous bond surfaces are contacted, provide non-acid type recommended by manufacturer where one or more porous bond surfaces are contacted.
3. Interior Glazing: Butyl rubber glazing sealant: Compound of polymerized butyl rubber and inert fillers, solvent based, 95 percent solids, formed and coiled in release paper, tack-free in 24 hours, paintable, non-staining.

C. Miscellaneous Glazing Materials: Provide materials with proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

2. Setting Blocks: 100 percent silicone material with a Shore A durometer hardness of 85 plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

E. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.07 FABRICATION

A. Factory fabricate glass and glazing products in sizes required to glaze openings indicated for project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements. Provide thickness indicated, or if not otherwise indicated, as recommended by glass manufacturer for application indicated.

B. Insulating glass: Provide manufacturer's standard units. Provide glass lights heat strengthened, except where fully tempered lights are indicated.

C. Heat strengthened and tempered glass:

1. Provide glass of type indicated, heat treated to strengthen glass in bending to not less than 2.0 times annealed strength for the strengthen glass and to not less than 4.5 times annealed strength for fully tempered glass.
2. Cut glass to required size before tempering. Comply with Glass Tempering Association recommendations.
3. Provide tongless tempered glass. When size limitations require tong edges, support each piece during tempering process so that tong marks will be concealed in the glazing system.

D. Safety Glazing: Provide fully tempered safety glass at location scheduled on the drawings as scheduled.

1. Provide fully tempered glass in exterior and interior doors and at panels adjacent to doors as indicated.
2. Provide fully tempered panels at other scheduled locations as indicated on the drawings of required by code.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine substrates, structure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Protect glass from edge damage at all times during and after installation. Do not cut, seam, nip or abrade tempered glass.

B. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

D. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION

A. Comply with combined recommendations and technical reports of manufacturers of glass and glazing materials used and with National Glass Association “GANA Glazing Manual," except when more stringent requirements are indicated.

B. Glazing channel dimensions as shown are intended to provide for necessary minimum bite on the glass, minimum edge clearance, and adequate sealant thicknesses with reasonable tolerances. The glazier is responsible for correct glass size for each opening within the tolerances and necessary dimensions established.

1. Unless noted otherwise, clearances are 3/16 inch face clearance, ¼ inch minimum edge clearance, and ½ inch minimum glass bite.

C. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing and their technical representatives except where more stringent requirements are shown or specified.

D. Inspect each piece of glass immediately before installation and eliminate those which have observable edge damage or face imperfections.

E. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in the same direction as other pieces.

3.04 GLAZING

A. Install setting blocks of proper size at quarter points of sill rabbet. Set blocks in thin course of the heel bead compound. Block shall be 1/16 inch less than the channel width.

B. Provide spacers inside and out and of proper size and spacing for glass sizes larger than 50 united inches, except where gaskets are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width; except with sealant tape, use thickness slightly less than final compressed thickness of tape.

C. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels) except as otherwise indicated, depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

D. Do not attempt to cut, seam, nip, or abrade glass which is tempered, heat strengthened, or coated.

E. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.

G. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation and eliminate stains and discoloration.

H. Where wedge shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs or by proven adhesives including embedment of gasket tail in cured heel bead.

3.05 FIELD QUALITY CONTROL

A. Watertight and airtight installation of exterior glass and glazing is required. Each installation shall withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure

including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

3.06 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of nay type to surfaces of tinted and reflective glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash and polish glass on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

3.07 GLAZING SCHEDULE

A. Tempered glazing for both curtainwall and storefront

Glass Type (GL-1):	**Insulating Units** (Units with Bird-Friendly glass)
Total Thickness:	1 inch nominal.
Exterior Pane:	Clear tempered glass, 1/4 inch thick, with Walker/Pilkington pattern 714 Aviprotek T coating (vertical pattern) on surface #1
Air Space:	1/2-inch, nominal filled with argon gas
Interior Pane:	Clear tempered glass, 1/4 inch thick with low “E” coating on surface #3
Reference	(see https://www.walkerglass.com/products-options/aviprotek-t-pattern-714/)

B. "Annealed" non-tempered glazing for both curtainwall and storefront

Glass Type (GL-2):	**Insulating Units** (Units with Bird-Friendly glass)
Total Thickness:	1 inch nominal.
Exterior Pane:	Clear annealed glass, 1/4 inch thick, with Walker/Pilkington pattern 714 Aviprotek T coating (vertical pattern) on surface #1
Air Space:	1/2-inch, nominal, filled with argon gas
Interior Pane:	Clear annealed glass, 1/4 inch thick.
Reference	(see https://www.walkerglass.com/products-options/aviprotek-t-pattern-714/

C. Interior Monolithic Glass

GLASS TYPE (GL-3)	**Tempered Glass** (Interior Doors and Interior Glazing)
Total Thickness	1/4 inch thick
	Clear tempered glass

D. Spandrel glazing (very limited application where a ceiling structure is visible beyond the glass) color by architect from manufacturer's standard color range.

Glass Type (GL-4):	**Insulating Spandrel Glass**
Total Thickness:	1 inch nominal.
Exterior Pane:	Clear tempered glass, 1/4 inch thick, with low “E” coating on #2 surface
Air Space:	1/2-inch, nominal with argon gas
Interior Pane:	Clear tempered glass, 1/4 inch thick, (with opaque ceramic frit coating (solid color) on #4 surface).

E. Glazing for windows:

GLASS TYPE (GL-5)	**Insulating Units** (Windows)
Total Thickness	3/4 inch nominal
Exterior Pane:	Clear annealed glass, 1/8 inch thick, with Low “E” coating on #2 surface
Air Space:	1/2 inch, nominal filled with argon gas
Interior Pane:	Clear annealed glass, 1/8 inch thick

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Construction and testing requirements for interior floor slabs and supplements requirements of Section 03 30 00 – Cast-in-Place Concrete and the Structural Drawings for the following:

1. Concrete materials.
2. Slab finish.
3. Curing of slabs.
4. Concrete Moisture and pH testing.
5. Moisture and pH control (remediation as needed).

B. Provide floor slab surfaces suitable for installation of floorcovering materials. No contract adjustments are allowed, since the Contractor controls construction schedule, concrete work, timing of building enclosure, and temporary facilities such as construction drying.

C. Related Sections:

1. Section 01 31 00 – Project Coordination: Preconstruction conference.
2. Section 03 30 00 – Cast-In-Place Concrete
3. Division 09 – Flooring Sections.

1.02 SLAB DRYNESS PRECEDENT TO ADHESIVE FLOORING INSTALLATION

A. Correlation of Slab Relative Humidity to Moisture Vapor Emission: For purposes of this contract, the fallowing correlation applies.

Slab Relative Humidity %	**Moisture Emissions lbs/1000 sf/24 hours** Moisture Emissions lbs/1000 s.f./24hrs
95%	20 lbs.
90%	15 lbs.
85%	10 lbs.
80%	7 lbs.
78%	5 lbs.
75%	3 lbs.

B. General: Follow floor covering manufacturer's recommendations for slab dryness. In the absence of such recommendations, the following guidelines apply.

C. Maximum 3-Pound Emission and pH of 9 or less: Suitable for installation of any type floor covering using normal adhesives.

D. Maximum 5-Pound Emission and pH of 9 or less: Suitable for installation of:

1. Carpet with vapor permeable backing (e.g. jute).
2. Other floor coverings using special adhesives approved by floor covering manufacturer.

E. Maximum 7-Pound Emission:

1. Suitable for installation of thin-set ceramic tile and similar materials using Portland cement base mortar.
2. Remediation or special adhesives required for installation of other floor coverings Verify pH within limits specified by adhesive manufacturer.

F. More than 7- Pound Emission: Remediation or additional drying required.

1.03 INFORMATION SUBMITTALS

A. Qualification Data: Submit for testing agency. Submittal is for information only.

B. Field Test Reports: Submit layout plan and test results for each location tested indicating time and date of each test. Report test results in chart form.

1. Calcium Chloride Test Method: Indicate test dates, start/stop time, start/stop weight, weight gain in grams, water vapor emission rate, and pH levels.
2. Relative Humidity Test Method: Indicate test dates, time, depth of test well, in-situ temperature, relative humidity and pH levels.
3. Submit record of ambient air temperature, ambient relative humidity, and floor slab surface temperature when test sites are prepared, start of test, and end of test.
4. Indicate condition of building enclosure including position of operable windows and exterior doors when test sites are prepared, start of test, and end of test.
5. Indicate operational status of HVAC systems maintaining environmental condition of spaces where tests are conducted when test sites are prepared, start of test, and end of test.

C. Product Data: Submit for each type of floor slab moisture remediation product proposed for use.

D. Warranty: Submit specimen warranty for each type of floor covering material installed.

1.04 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 – Project Coordination.

B. Scheduling: Schedule work to permit concrete moisture testing to be completed minimum one week and maximum 3 weeks before floor coverings are installed.

C. Testing Agency Qualifications: At a minimum, testing agency or individuals shall demonstrate verifiable experience in vapor emission and pH testing, or be certified by recognized organizations, such as the Institute of Inspection, Cleaning and Restoration Certification (IICRC), or equivalent.

D. Contractor shall be responsible for obtaining confirmation from the respective finish flooring manufacturer that floor covering installation may proceed under the guidelines stated in this section, without invalidating the warranty of each respective floor covering material manufacturer.

1. Additional testing by floor covering installer to determine suitability of slab is recommended but not required.

1.05 PROJECT CONDITIONS

A. Ambient Conditions:

1. Do not perform concrete moisture testing until building is enclosed and HVAC system is operational.

B. Substrate: Proceed with testing only after the following conditions have been attained:

1. Concrete is properly cured, 28-days, minimum.
2. Concrete has been cleaned to remove curing compounds and sealer, and is dry.
3. Concrete has been maintained at the same temperature and humidity conditions as the final floor covering will be exposed to for 48 hours before, during, and continuously after conducting testing.

1.06 WARRANTY

A. Warrant floor covering installations against failure due to slab moisture emissions and pH.

B. Warranty to include labor and materials required to remove failed flooring, remedy slab emissions, and install new flooring. Warranty may be underwritten by flooring manufacturer, remediation system manufacturer, Contractor, or a combination of those entities.

1. Warranty period: 2 years.

PART 2 – PRODUCTS

2.01 FLOOR SLAB MOISTURE REMEDIATION PRODUCTS

A. Systems listed below are recommended by their respective manufacturer to reduce the moisture emissions from the named maximum to 3 lbs 1000 s.f./24 hours.

B. Acceptable Manufacturers:

1. Ardex: Ardex MC
2. CreteSeal: CS 2000 2-day system.
3. Floor Seal Technology: System 300
4. Koster: VAP 1 2000.
5. Vexcon Chemical: "Moisturebloc Emulsion Vapor Reduction"
6. W.F. Taylor "Lockdown Moisture Control System":

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify new concrete floors have cured minimum 28 days.

3.02 PREPARATION

A. When a building HVAC system is not operational and maintaining test areas at design operational conditions, install recording hygrometer or data logger in each separate test area to record ambient temperature and relative humidity beginning 48 hours before start of tests until completion of tests within each area.

B. Identify three moisture test sites for first 1,000 sf and one moisture test site for each additional 1,000 sf of floor area receiving floor covering on each separate floor slab.

1. Layout test site locations uniformly distributed throughout each test area.

C. Mechanically clean each test site to remove oils, laitance, curing compounds, adhesives, and other contaminates affecting water vapor emissions.

1. Remove cleaning residue.
2. Do not apply water or other liquid to floor slabs and test sites.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform concrete moisture tests and inspections and prepare test reports:

B. Acceptance Criteria:

1. Concrete floor slabs will be considered acceptable for installation of floor finishes when:

   a. Calcium Chloride Test Result: 3 lb of water/1000 sf in 24 hours maximum moisture vapor transmission rate.
   b. Relative Humidity Test Result: 75 percent maximum relative humidity.
   c. pH Test Result: Within alkalinity range of 7.0 to 9.0.

2. When concrete floors do not meet acceptance criteria, obtain recommendations from floor finish manufacturers for remediation measures necessary to permit successful floor finish installation.

C. Concrete Moisture Testing – General:

1. Conduct calcium chloride test and relative humidity test at each test site.
2. Conduct one pH test at each test site.
3. Moisture testing requires controlled environment of 65 to 85 F and 40 to 60% R.H. for minimum 48 hours before test until completion of test
4. Conduct pH tests per ASTM F 710 concurrent with moisture testing. Consistent readings of pH 9 or less require no action; for higher pH levels consult manufacture of product (adhesive or remediation system) in contact with slab surface for correction requirements.

D. Calcium Chloride Testing: Acceptable Method ASTM F 1869

E. Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride.

1. Emission rate test may be used to confirm performance of proprietary moisture remediation systems.
2. Film forming curing compounds and remediation systems require emission rate test to verify performance and suitability to receive flooring. Sampling frequency reduced to 2 tests per representative area.
3. For floor finishes requiring scarification (e.g. shotblasting) of the slab surface, perform emission testing after scarification.

F. Relative Humidity Testing: Perform tests in accordance with ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes.

1. Recommended product: Wagner Electronics "Rapid RH" probes.
2. Probe depth below top surface: 40 percent of slab thickness for slab on grade and slab on metal deck.
3. Drill test hole at each test site to accommodate test sleeve.
    a. Hole Diameter: In accordance with test equipment manufacturer’s instructions.
    b. Drilling Fluids: Not permitted.
4. Vacuum dust and debris from test hole.
5. Insert sleeve, to the full depth of test hole. Cap or plug sleeve to prevent test hole contamination.
6. Permit the test site to acclimate for minimum 72 hours before measuring relative humidity.
7. Remove sleeve plug and insert probe to bottom of test hole. Allow test probe to reach temperature equilibration with concrete slab.
8. Measure and record temperature and relative humidity at the test site.

G. Test Reports: In addition to information specified by ASTM standard, calculate results normalized to 75 degrees F and 50 percent R.H. ambient conditions and slab temperature.

3.04 FLOOR SLAB MOISTURE REMEDIATION APPLICATION

A. General: Comply with remediation product manufacturer's recommendations for surface preparation, application, curing, and protection of moisture remediation system.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Interior gypsum board faced walls, partitions, and ceiling assemblies, and supplementary items necessary for installation as follows.

1. Gypsum board trim and finishing (joint tape and compound treatment).
2. Acoustical treatment within partitions and shaft wall assemblies as indicated on drawings.
3. Special requirements for acoustical wall construction.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry: Wall framing, ceiling suspension systems, wall furring, etc.
2. Section 09 30 13 – Tiling
3. Section 09 91 00 – Painting: Paint coatings on gypsum board.

1.02 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms not defined in this Section or in other referenced quality standards.

B. Damage: Stored or installed paper faced gypsum board materials not specifically manufactured as “moisture-resistant products” shall be classified as defective and nonconforming Work if they have been exposed to wetness or dampness at any time prior to Substantial Completion or if they exhibit evidence of active or dormant mold or mildew.

1.03 REFERENCE STANDARDS

A. In addition to requirements shown or specified, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:

1. GA 216 – Application and Finishing of Gypsum Board by Gypsum Association.
2. GA 214 – Recommended Levels of Gypsum Board Finish by Gypsum Association.
3. GA 600 – Fire Resistance Design Manual by Gypsum Association

1.04 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data: Manufacturer’s technical literature for each product and system indicated.

1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.

1.05 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

B. Field Quality Control Reports: Written report of testing and inspection required by “Field Quality Control”.

C. Manufacturer’s Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required.

D. Qualification Data:

1. For manufacturer and installer.

2. For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
3. Architect may waive Submittal of Qualification Data for Manufacturers listed in this Section.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with not less than 5 years' experience with successful production of products and systems similar to scope of this Project, with a record of successful in-service performance and completion of projects for a period of not less than 5 years, and with sufficient production capability, facilities and personnel, to produce required Work.

1. Source Limitations: Provide gypsum products manufactured within the United States from materials free of sulfur, formaldehyde or other deleterious chemicals. Natural gypsum ore shall be mined in North America. Synthetic (Byproduct) gypsum shall be pure calcium sulfate from domestic sources.

B. Installer Qualifications:

1. Experience: Installer with not less than 5 years' experience in performing specified Work similar to scope of this Project, with a record of successful in-service performance and completion of projects for a period of not less than 5 years and with sufficient production capability, facilities, and personnel to produce required Work.
2. Supervision: Installer shall maintain a competent supervisor who is at Project site during times specified Work is in progress that is experienced in installing systems similar to type and scope required for Project.

C. Sound (STC) Resistance Rated Assembly Characteristics: Provide materials and construction identical to those tested according to ASTM E 90 and classified according to ASTM E 413 by independent and testing agency acceptable to authorities having jurisdiction.

1.07 MOCKUP

A. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up to comply with the following requirements, using materials indicated for the completed Work:

1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.
    a. Show typical components, attachments to building structure, and requirements of installation.
    b. Field Samples for Gypsum Board Finishing: Build 10 ft (3 m) square gypsum board (attached to metal studs) area for Level 4 finish. Include not less than one tapered-to-tapered edge gypsum board joint and cut edge-to-cut edge gypsum board joint.
    c. Include transition joint between gypsum board and exposed wood timber framing showing finish of reveal with metal trim.
2. Clean exposed faces of mock-up.
3. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Protect accepted mock-up from the elements with weather-resistant membrane.
6. Obtain Architect's acceptance of mockups before starting fabrication.
7. Maintain mock-ups during construction in an undisturbed condition as a standard for review of the completed Work.
8. Acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor, submitted to Architect in writing, and accepted by Architect in writing.
9. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Reference: Gypsum Association GA-801: Handling and Storage of Gypsum Products.

B. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

C. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and other trim from being bent or damaged.

E. Protect gypsum board panels to prevent damage to edges, ends, and surfaces.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Comply with requirements of ASTM C840 or recommendations of gypsum board manufacturer whichever more stringent, for environmental conditions before, during and after application of gypsum board.

B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F. Do not exceed 95 degrees F when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent finishing materials from drying too rapidly.

D. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

1. If Contractor chooses to install gypsum panels before areas are enclosed and conditioned, he does so entirely at his own risk. Damaged panels shall be removed and new panels installed at Contractor's expense and will not be deemed cause for additional time.

E. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

F. Provide adequate lighting and ventilation during installation and joint finishing treatment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Provide products from one of the named manufacturers below.

B. Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include those listed under gypsum board products:

1. Manufacturers:

a. United States Gypsum Company (USG)
b. National Gypsum Company, LLC
c. CertainTeed Gypsum Corp
d. Georgia-Pacific Gypsum

C. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.02 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

B. Engineer products and systems to withstand loads within limits of allowable working stresses of the materials involved under conditions indicated and without permanent deformation or failure of materials.

1. Design Loads: Engineer to withstand design loads including but not limited to gravity, wind, seismic, and erection design loads established by authorities having jurisdiction, applicable local building codes, and as indicated.
2. Structural Movement: Engineer to withstand movements of structure including, but not limited to, drift, twist, column shortening, long-term creep and deflection from uniformly distributed and concentrated live loads. Contractor shall obtain required design data and identify movements accommodated on submittal drawings.

    a. Accommodate plus or minus 3/8 in (10 mm) differential vertical deflection of floors.

C. Dimensional Tolerances: Engineer products and systems to accommodate dimensional tolerances of framing members and adjacent construction.

2.03 GYPSUM BOARD PRODUCTS

A. Sizes: Maximum lengths and widths available that will minimize short edge-to-short edge butt joints and to correspond to support system indicated.

B. Typical Paper-Faced Gypsum Board Products:

1. Paper-Faced Type X Gypsum Board:

    a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
    b. Description: Noncombustible fire-resistant gypsum core with paper surfacing on face, back, and long edges; tapered long edges; 5/8 in. thick.
    c. Manufacturers and Products:

        1) United States Gypsum Company (USG); Sheetrock Firecode X Gypsum Panels, or Sheetrock Brand EcoSmart Firecode X Panels.
        2) National Gypsum Company, LLC; Gold Bond Fire-Shield Gypsum board.
        3) CertainTeed Corporation; Type X Drywall Panel.
        4) Georgia-Pacific Gypsum LLC; ToughRock Fireguard X Gypsum Board.

2. Abuse-Resistant Paper-Faced Gypsum Board:

    a. Material Quality Standard: ASTM C 1396 / C 1396M, Type X.
    b. Description: Specially formulated, noncombustible, gypsum core with heavy liner paper on back and smooth, heavy abrasive-resistant face paper on face and long edges; manufactured to produce greater resistance to surface indentation and through-penetration than typical gypsum panels; tapered long edges; 5/8 in thick.
    c. Manufacturers and Products:

        1) United States Gypsum Company (USG); Sheetrock Brand AR Firecode X Panels or Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode® X.
        2) National Gypsum Company; Gold Bond XP Hi-Abuse Gypsum Board.
        3) CertainTeed Corporation; Extreme Abuse Resistant Drywall.
        4) Georgia-Pacific DensArnor Plus Fireguard Abuse-Resistant Interior Panels.

3. Impact-Resistant Gypsum Wallboard: ASTM C1396 and ASTM C 1629, manufactured to produce greater resistance to through-penetration than standard, regular-type and Type X gypsum board.

    a. Description:

        1) Core: 5/8 inch, Type X with additives to enhance fire resistance, surface indentation resistance and impact resistance, moisture and mold resistance.
        2) Surface Abrasion: ASTM C1629, abrasion resistant, 100% recycled content moisture/mold/mildew resistant paper on front, back and long edges.
        3) Embedded fiberglass mesh.

4) Long Edges: Tapered

b. Panel Physical Characteristics:

1) Surface Abrasion (ASTM C1629), meets or exceeds Level 2.
2) Surface Indentation (ASTM C1629), meets or exceeds Level 1.
3) Soft Body Impact (ASTM C1629), meets or exceeds Level 3.
4) Hard Body Impact (ASTM C1629), meets or exceeds Level 3.
5) Mold and Mildew Resistance: Panel score of 10, when tested in accordance with ASTM D3273.

c. Manufacturers and Products:

1) United States Gypsum Company (USG); Sheetrock Mold-Tough VHI Firecode X Gypsum Board.
2) National Gypsum Company; Gold Bond Hi-Impact XP Gypsum board.
3) Georgia-Pacific Gypsum LLC; DensArmor Plus Fireguard Impact-Resistant Interior Panel Gypsum Board.
4) CertainTeed Corporation; AirRenew Extreme Impact Resistant Drywall.

C. Moisture-Resistant Gypsum Board Products:

1. Moisture-Resistant Paper-Faced Gypsum Board:

a. Material Quality Standard: ASTM C 1396, Type X.
b. Description: Enhanced moisture-resistant, noncombustible gypsum core, with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 5/8 in. thick.
c. UL Type Designation: “SCX”
d. Manufacturers and Products:

1) United States Gypsum Company (USG); Sheetrock Brand Mold Tough Panels Firecode X or Sheetrock Brand EcoSmart Mold Tough Firecode X Panels.
2) National Gypsum Company; Gold Bond XP Gypsum Board.
3) CertainTeed Corporation; ProRoc Moisture and Mold Resistant Type X Gypsum Board.
4) Georgia-Pacific Gypsum LLC; ToughRock Fireguard X Mold-Guard Gypsum Board.

2. Moisture-Resistant Paper-Faced Shaft-Liner Gypsum Board:

a. Material Quality Standard: ASTM C1396, Type X
b. Description: Enhanced moisture-resistant, noncombustible gypsum core with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 1 in (25 mm) thick.
c. Manufacturers and Products:

1) USG Corp.; SHEETROCK Mold Tough Gypsum Liner Panels.
2) National Gypsum Co.; Gold Bond 1• Fire-Shield Shaftliner XP.
3) Certainteed Corp.; GlasRoc Shaftliner

3. Moisture-Resistant Paperless Glass-Mat Shaft-Liner Gypsum Board:

a. Material Quality Standard: ASTM C 1396 / C 1396M
b. Description: Enhanced moisture-resistant, noncombustible gypsum core with inorganic, embedded fiberglass mat on both faces, double bevel long edges; score of 10 according to ASTM D 3273; 1 in (25 mm) thick.
c. Manufacturers and Products:

1) USG Corp.; SHEETROCK Glass-Mat Liner Panels
2) Georgia-Pacific Gypsum LLC; DensGlass Shaftliner.
3) Certainteed Corp.; GlasRoc Shaftliner

2.04 TILE BACKING PANELS

A. Moisture-Resistant Paper-Faced Gypsum Board:

1. Material Quality Standard: ASTM C 1396, Type X.

2. Description: Enhanced moisture-resistant, noncombustible gypsum core, with moisture-resistant paper surfacing on face, back and long edges; tapered long edges; score of 10 according to ASTM D 3273; 5/8 in. thick.
3. UL Type Designation: “SCX”
4. Manufacturers and Products:

    a. United States Gypsum Company (USG); Sheetrock Brand Mold Tough Panels Firecode X or Sheetrock Brand EcoSmart Mold Tough Firecode X Panels.
    b. National Gypsum Company; Gold Bond eXP Tile Backer.
    c. CertainTeed Corporation; ProRoc Moisture and Mold Resistant Type X Gypsum Board.
    d. Georgia-Pacific Gypsum LLC; ToughRock Fireguard X Mold-Guard Gypsum Board.

B. Fasteners: ASTM C1002, USG Type “W” Bugle head screws for metal framing, manufacturer’s recommended length for panel thickness indicated..

2.05 TRIM ACCESSORIES

A. Paper Faced Metal Trim: Trim members conforming with ASTM C 1047 is required. Provide galvanized steel laminated with paper trim designed for concealed metal and for application without mechanical fastening, unless otherwise specified; sizes compatible with thickness of drywall.

B. Typical Drywall Trim Accessories:

1. Material Quality Standard: ASTM C 1047.
2. Description: Trim profile fabricated of paper-faced galvanized or aluminum-coated steel sheet; of required size for gypsum board thickness.
3. Manufacturers:

    a. United States Gypsum Company (USG)
    b. MarinoWare
    c. Phillips Manufacturing.
    d. ClarkDietrich Industries, Inc.

4. Trim Products:

    a. Cornerbead:

        1) Purpose: For protecting outside (external) and inside corners.
        2) Basis of Design: ClarkDietrich Paper-Faced Corner Bead and Paper-Faced Inside Corner Bead.

    b. L-Trim:

        1) Purpose: For protecting exposed edges of gypsum board where gypsum board terminates.
        2) Basis of Design: ClarkDietrich Paper-Faced L-Trim.

    c. Control Joint:

        1) Description: One-piece trim formed with V-shaped slot, with removable strip covering slot opening.
        2) Purpose: For conditions requiring expansion and contraction stresses of large areas of gypsum board to be relieved.
        3) Basis of Design: ClarkDietrich 093 Zinc Control Joint.

2.06 FASTENERS

A. Limitations: Nails and staples are not permitted.

B. Wood Framing Screws: Screw fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten metal framing and furring members securely to substrates involved; complying with recommendations of gypsum board manufacturers for applications indicated.

C. Gypsum Board Screws:

1. Product Description - Standard Applications: Bugle head, self-drilling, self-tapping, steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective

gypsum board manufacturer; minimum 1 in (25 mm) long; with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2. Product Description - High Moisture / Humidity Applications: Bugle head, self-drilling, self-tapping, stainless steel screws with Phillips-head recess of size, holding power, and other properties recommended by respective gypsum board manufacturer; for use at high moisture areas such as Kitchens, Showers and Tub Enclosures, Saunas, Steam Rooms, and Pool Enclosures.

D. Miscellaneous Fasteners: For conditions not indicated, fasteners shall be type, finish, size, and holding power recommended by respective gypsum board manufacturer and conditions.

2.07 JOINT TREATMENT MATERIALS

A. Joint Compound: ASTM C475, board manufacturer's standard ready-mixed, low-VOC joint compounds with no detectable amounts of crystalline silica based on NIOSH Method 7500.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose joint compound.

D. Setting Type Joint Compound for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
2. For pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer.
3. For topping compound, use sandable formulation.

E. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.
2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
3. Topping compound formulated for fill (second) and finish (third) coats.
4. Lightweight Joint Compound: Specifically formulated to reduce airborne dust while sanding.

    a. Basis of Design: ProForm Lite Ready Mix Joint Compound with Dust-Tech as manufactured by National Gypsum, or equal products of the other named manufacturers.

F. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Tile Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting- type, sandable topping compound.

2.08 SOUND ATTENUATION INSULATION

A. Sound Attenuation Batts: Glass or other inorganic fibers and resinous binders formed into flexible batts or blankets, complying with ASTM C665, Type I unfaced, manufacturer's standard sizes, thickness as indicated; lengths and widths required to interface with size of space insulated, maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:

B. Fiberglass Sound Attenuation Blankets:

1. Material Quality Standard: ASTM C 665, Type I.

2. Description: Unfaced blankets produced by bonding inorganic glass fibers with a thermosetting binder.
3. Surface Burning Characteristics: According to ASTM E 84/NFPA 255/UL 723:
    a. Flame Spread: Class A no greater than 25.
    b. Smoke Developed: No greater than 50.
4. Thickness: Not less than 2-1/2 in (62 mm), unless otherwise indicated.
5. Manufacturers and Products:
    a. CertainTeed Corporation; CertaPro AcoustaTherm Batts.
    b. Johns Manville Building Insulation Div.; Sound Control Batts.
    c. Knauf Fiber Glass; QuietTherm.
    d. Owens Corning; Sound Attenuation Batts.

C. Mineral Wool Sound Attenuation Blankets**:**

1. Basis-of-Design Product: Subject to compliance with requirements, provide ROCKWOOL (Roxul, Inc.); Safe'n'Sound or comparable product by one of the following:
    a. Johns Manville; a Berkshire Hathaway company.
    b. Thermafiber, Inc.; an Owens Corning company.
2. Nominal Density: 2.4 lb/cu. ft.
3. Thermal Resistivity: Not less than 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F
4. Flame-Spread Index: Not more than zero when tested in accordance with ASTM E84.
5. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
6. UL Classification Code: BZJZ

D. Acoustical Sealant for Non-Fire Resistance Rated Joints:

1. Description: Nonsag, nonstaining latex sealant complying with ASTM C 834 that is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Acceptable manufacturers and products:
    a. Hilti Inc.; CP 506 Acoustical Sealant and CP 572 Acoustical Spray
    b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
    c. United States Gypsum Company (USG); Sheetrock Acoustical Sealant.

2.09 RELATED MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Acoustical Joint Sealant: At acoustically rated assemblies, comply Section 07 92 00, "Acoustical Joint Sealants."

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

1. Verify rough-in utilities and blocking is in proper position.

B. Do not proceed with installation until deficiencies are corrected and surfaces to receive gypsum board are acceptable.

C. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of gypsum board is started.

3.02 PREPARATION

A. General: Comply with manufacturer's instructions, recommendations and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

B. Suspended Gypsum Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hanger wires at spacing required to support ceilings and that hangers will develop their full strength.

C. Items Which Require Backer Plates or Blocking: Coordinate sizes and locations.

1. Install additional studs for attachment of backer plates and blocking in required locations to receive surface mounted accessories as indicated or as required by accessory manufacturer.
2. Elimination of backer plates and blocking is not permitted.
3. Direct attachment of items to studs is not permitted.

3.03 INSTALLATION – ACOUSTICAL INSULATION

A. STC-Rated Assemblies: Comply with requirements of indicated Gypsum Association or other assembly designs.

B. Do not install sound attenuation blankets until mechanical and electrical work within framing spaces is complete.

C. Install sound attenuation blanket in contact with one face of partitions scheduled to receive sound insulation. Install insulation with daubs of adhesive applied to back of gypsum board or with adhesive applied to edge of studs to maintain full coverage and prevent slumping at tops of partitions and other displacement.. Sound insulated partitions shall be constructed, insulated and caulked so as to produce sound transmission coefficient rating (STC) indicated. Do not locate outlets, switches or similar items on opposing sides of partition within same stud space.

D. Fit sound attenuation blankets tight around cut openings and penetrations, and behind and around electrical and mechanical items within framing spaces. Pack blankets around door and window frames, between jamb studs, in boxed headers, and in other voids.

3.04 INSTALLING ACOUSTICAL SEALANTS

A. Comply with ASTM C919 and manufacturer's recommendations for location of acoustical sealant beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings.

B. Provide continuous bead of sealant under bottom edge of gypsum board and wall cut outs, at toilet room partitions and other partitions receiving sound insulation so as to completely seal wall against sound leaks.

C. Apply 3/8 inch continuous bead of acoustical sealant to face of runner tracks before applying gypsum boards; completely seal wall against sound leaks.

D. Where sound attenuation blankets are installed in partitions, seal perimeters, control and expansion joints, openings, and penetrations with continuous beads of acoustical sealant at both faces of partition.

1. Apply acoustical seals to electrical boxes and other penetrations of gypsum board.

E. Do not allow acoustical sealant to remain exposed to air for more than 15 minutes before panel is applied.

F. Completely seal around perimeter of and penetrations through sound walls, including intersections with walls, columns, and other adjacent construction; fill depth of gaps around gypsum panels at floor, structure above, door frames, and other openings; and at cutouts for electrical boxes, pipes and plumbing, and other penetrations. Cut panels accurately to fit penetrations. Caulk openings in non-fire rated partitions with acoustical sealant.

G. Putty Pads:

1. Before installing wallboards, install putty pads in accordance with manufacturer's written instructions.

2. Overlap front edge of box so that putty will be compressed around edges of box as gypsum panels are installed.
3. Applications:

    a. Electrical boxes at interior gypsum board faces of exterior walls.

3.05 INSTALLATION, GENERAL

A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:

1. United States Gypsum Company (USG); Gypsum Construction Handbook, if no other installation quality standard applies to condition.
2. Respective Manufacturer's written installation instructions.
3. Accepted submittals.
4. Contract Documents.
5. Gypsum Association GA 216.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

3.06 INSTALLATION OF GYPSUM BOARD ASSEMBLIES

A. Gypsum Board Installation Requirements: Comply with ASTM C840.

1. Do not proceed with gypsum board installation until blocking, framing, bracing, and other supports for subsequently applied work have been reviewed, installed, and accepted by the Architect.
2. Do not install gypsum board until thermal and acoustical insulation, membrane vapor barriers, and other work concealed by gypsum board have been installed.

B. Acoustically Rated Partitions:

1. Verify that resilient channels where required are installed properly.
2. Install gypsum board with long dimension parallel to resilient channels and end joints staggered. Allow 1⁄8 inch spacing between the ceiling perimeter and adjacent walls and fill with acoustical sealant. Attach gypsum board with screws at recommended spacing along channels. Do not to fasten gypsum board through the channel into wood joists. Joints between boards should be centered over the resilient channels, or be midway between channels with joints floated and backed with sections of channels. Provide 3-mm (1⁄8-in.) spacing between the edges of boards, floor, and adjacent walls, and to fill space with acoustical sealant.

C. Penetrations and Openings: Construct within gypsum board assemblies work as required to properly form penetration or opening to receive firestopping materials specified in following Sections:

1. Section 07 84 00 – Firestopping.

D. Control Joints: Install control joints at locations indicated on Drawings, in specific locations approved by Architect for visual effect and according to the following:

1. Spaced not more than 30 feet in either direction for uninterrupted straight planes of ceilings and walls.
2. Where different substrates occur at ceilings and walls.
3. Where control joints occur in substrates at ceilings and walls.
4. Where ceilings and walls abut inside face of exterior walls.
5. Where L, U, or T shaped ceiling configurations are joined.
6. Where less-than-ceiling-height door frames occur on walls more than 30 feet in length; extend control joints from top of frame up to ceiling at corner of hinge side of door
7. Where less-than-ceiling-height borrowed lites occur on walls more than 30 feet in length; extend control joints from top of frame up to ceiling and from bottom of frame to floor at both corners.

E. Isolation from Building Structure: Isolate gypsum board assemblies from building structure to prevent transfer of loading imposed by structural movement.

1. Provide isolation joints as indicated or required by installation quality standards.
2. Isolate ceiling assemblies abutting or penetrated by building structure.
3. Isolate partition framing and wall furring abutting or penetrated by building structure, except at floor.

F. Acoustical Putty Pads:

1. Before installing wallboards, install putty pads in accordance with manufacturer's written instructions.
2. Hand apply pads packing tightly into gaps and openings, in such a manner that pad will remain secured to surface; pinch pleat excess material together to close gaps.
3. Overlap front edge of box so that putty will be compressed around edges of box as gypsum panels are installed.
4. Applications: Electrical/telecommunications boxes in acoustical partitions.

G. Supplemental Accessories: Install supplementary framing, blocking, reinforcing, and bracing in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, hand rails, furnishings, or similar construction. Comply with details indicated and recommendations of installation quality standards or manufacturer.

3.07 INSTALLATION OF TILE BACKER BOARD

A. Tile Backing Panels

1. Backer Units: ANSI A108.11, at locations indicated.
2. Areas Not Subject to Wetting: Install Moisture and Mold Resistant gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive cementitious backer units.
3. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
4. Precut panels to required sizes and treat necessary edges at penetrations, joints, and intersections before panel installation with Sheetrock W/R compound. Treat all fastener heads with Sheetrock W/R compound after installation. Fill all openings around pipes, fittings, and fixtures with Sheetrock W/R compound before ceramic tile installation.
5. Space fasteners maximum 8 in. o.c. for walls, 6 in. o.c. for ceilings, with perimeter fasteners dimension per manufacturer's instruction. Drive screws so bottoms of heads are flush with panel surface to ensure firm panel contact with framing. Do not overdrive fasteners.
6. Manufacturer recommended tile backer screws for steel framing or wood framing per project conditions.
7. Prefill joints with tile-setting mortar or adhesive and then immediately embed tile backer tape and level joints.
8. If waterproofing is required to be applied to panels per Division 09 Section "Tiling," confirm approved product with tile backing panel manufacturer.

3.08 INSTALLING GYPSUM BOARD PRODUCTS

A. General Requirements:

1. Install type of gypsum board at location indicated by gypsum board schedule at end of this Section.
2. Do not install damaged gypsum boards.
3. Install gypsum boards with finish face side out.
4. Butt gypsum boards together for a light contact at edges and ends with not more than 1/16 in (1.5 mm) of open space between panels.
5. Do not force gypsum boards into place.
6. Do not place tapered edges against cut edges or ends.

B. Isolation from Building Structure and Window and Door Frames:

1. Apply edge trim where gypsum board abuts dissimilar materials including exposed wood timber framing.
2. Provide 1/4 in to 1/2 in (6 mm in 12 mm) wide spaces at these locations and trim edges with edge trim where edges of gypsum boards are exposed.
3. Seal interior joints between edge trim and abutting structural surfaces with acoustical sealant.

C. Single-Layer Board Assemblies:

1. At typical conditions, install gypsum board vertically (long dimension parallel to metal framing), to minimize short end-to-short end joints unless otherwise indicated or required by assembly fire test reports.

2. At interior of stairwells and other high walls, install gypsum boards horizontally, unless otherwise indicated or required by assembly fire test reports. Stagger abutting end joints not less than one framing member in alternate courses of gypsum boards.

D. Multi-Layer Board Assemblies: Apply base layers and face layers vertically (long dimension parallel to framing) with joints of base layers located over stud or furring member and face layer joints offset at least one stud space from base layer joints, unless otherwise indicated or required by assembly fire test reports. Stagger joints on opposite sides of partitions.

E. Ceiling Applications:

1. Apply gypsum board at right angles to main beams of suspension framing to minimize number of abutting end joints and avoid abutting end joints in central area of each ceiling.
2. Stagger abutting end joints of adjacent panels not less than one framing member.
3. Locate both edge or end joints of gypsum boards over intermediate supports or gypsum board back-blocking where framing is not present.

F. Typical Wall Applications:

1. Attach gypsum boards to metal studs so that leading edge or end of each board is attached to open (unsupported) edges of stud flanges first.
2. Stagger vertical joints on opposite sides of partitions.
3. Do not make joints other than control joints at corners of framed openings.
4. Attach gypsum boards to framing provided at doors, windows, other openings and cutouts. Avoid gypsum board joints within 12 in. of the corners of these openings.
5. Cut gypsum board to allow for a minimum 1/4 in. gap between gypsum board and floor to prevent potential wicking of moisture.
6. Cover both faces of wood framing with gypsum boards as indicated, except in chase walls that are braced internally.
7. Cut and fit gypsum boards around ducts, pipes, conduits, and other penetrations to form proper annular joint to receive firestopping.
8. Where partitions intersect open building structure members projecting below underside of floor slabs and roof decks, cut to fit profile formed by coffers, joists, beams, and other structural members; form proper annular joint to receive firestopping.
9. Support both edge and end joints of gypsum boards over wood framing.

G. Screw Attachments:

1. Attach gypsum board to wood framing with screw fasteners of type appropriate for gypsum board materials and installation conditions:

    a. Length shall be as required by condition and penetrating framing not less than 3/8 in (10 mm).
    b. Spacing shall be as recommended by installation quality standard, gypsum board manufacturer, or respective assembly test report.
    c. Use properly adjusted, positive-clutch electric power tool equipped with adjustable screw-depth head and a Phillips bit. Nails and staples are not permitted.

2. Drive screws to slightly dimple surface without breaking face paper, fracturing core, or stripping metal framing member around screw shank.
3. Space screws for non-fire resistance rated partitions and ceilings as recommended by installation quality standards.
4. Start field screwing near center and work towards edges.
5. Space screws not less than 3/8 in (10 mm) from gypsum boards edges.
6. Do not attach gypsum boards to top runner where wall or partition extends to building structure unless required by fire test reports.

H. Control Joints: Form control joints and expansion joints at locations indicated with required space between edges of adjoining gypsum boards.

I. Sound Attenuation Blankets: Install blankets within stud cavities set so that they are held in place by friction with metal studs; ensure blankets are secure within cavity and will not become displaced when second gypsum board side is closed.

J. Sealant:

1. Seal wall assemblies at perimeters, behind control joints, and at openings and penetrations with a continuous bead of sealant material according to following:
    a. Water Resistance Sealant: Joints within non-fire resistance rated assemblies exposed to possible water infiltration.
    b. Acoustical Sealant: All other joints.

3.09 INSTALLING TRIM ACCESSORIES

A. Attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840.

1. Install double studs to create control joints, leave 1/2 inch separation between gypsum board panels for installation of control joint units.
2. For Non-Rated Smoke Partitions: Construct joints to comply with detail for wall rating.
3. Routing gypsum board to create joint is not acceptable.

C. Control Joint Locations: Where indicated, but not less than the following.

1. Locations of control and expansion joints in substrate or framing.
2. Walls: Maximum 30 ft o/c; coordinate locations with Architect. Wall or partition-height door frames may be considered as control joints.
3. Ceilings: In ceilings larger than 2500 square feet, locate control joints maximum 50 feet on center each way, and at all locations where framing or furring change direction. Coordinate locations with Architect.
4. Joints between different types of gypsum board in same plane.

D. Interior Trim:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

E. Exterior Trim:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

F. Cornerbead: Install in single pieces at vertical corners.

G. Edge Trim: Install where edge of gypsum board would otherwise be exposed or semi-exposed.

1. Install trim in a single piece on each side of opening perimeters with joints only at corners. If size of opening exceeds available length of edge trim, coordinate locations of joints with Architect.

H. Reveals: Install trim plumb, level, accurately aligned, and fitted neatly with hairline joints.

1. Cut trim with sharp power saw and file cut edges to remove burrs.
2. Miter joint at changes in direction or plane, except that inside corners may be coped.
3. Apply masking tape or other protection to reveal surfaces before starting drywall finishing to keep surfaces clean and free of finishing compound and other substances.
4. For Rated Fire and Smoke Barriers and Non-Rated Smoke Partitions: Construct reveals to comply with detail for wall rating.
5. Routing gypsum board to create reveal is not acceptable.

3.10 FINISHING GYPSUM BOARD PRODUCTS

A. General: Treat board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare surfaces for decoration.

B. Joint Tape: Finish joints according to following:

1. Typical Paper-Faced Gypsum Board: Paper.
2. Moisture-Resistant Paper-Faced Gypsum Board: Mesh tape.

C. Finishing: Finish boards and units to achieve specified level of finish as indicted in schedule at end of section.

1. Typical Paper-Faced Gypsum Board: Either or combination of the following as recommended by manufacturer:
    a. Setting-type joint compounds.
    b. Drying-type joint compounds.
2. Moisture-Resistant Paper-Faced Gypsum Board: Setting-type joint compounds.

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall inspect first day's Work and periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, and instructions. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.

3.12 ADJUSTMENTS

A. Damaged Materials: Stored or installed paper-faced gypsum board materials not specifically manufactured as "moisture-resistant products" shall be classified as damaged, defective, and nonconforming Work if they have been exposed to wetness or dampness at any time prior to Substantial Completion or if they exhibit evidence of active or dormant mold or mildew. Damaged materials and assemblies shall be replaced with new and dry materials and assemblies.

3.13 PROTECTION

A. Procedures: Protect products and systems from damage during installation and remainder of construction period according to manufacturer's instructions.

3.14 GYPSUM BOARD SCHEDULE

A. Gypsum Board Schedule, General: Install the designated gypsum board product based on exposure classification to water and / or moisture and applied finish system as follows, unless otherwise indicated or scheduled on the Drawings.

B. No Exposure: Surfaces not normally exposed to water and / or moisture sources including but not limited to the following:

1. Typical walls and ceilings.
    a. Paint and Wall Coverings Only: Typical paper-faced gypsum board.
    b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.
2. Abuse-resistant walls as indicated in the Drawings:
    a. Paint and Wall Coverings Only: Abuse-resistant paper-faced gypsum board.
3. Shaft-Side Face of Shaft-Liner Assemblies:
    a. No Finish Required: Moisture-resistant paper-faced shaft liner gypsum board or moisture resistant paperless glass mat shaft liner gypsum board.

C. Incidental Exposure: Surfaces immediately adjacent to water and / or moisture sources including, but not limited to, the following locations:

1. Top of walls above ceilings adjacent to mechanical equipment in corridors.
2. Walls and ceilings in mechanical equipment rooms and janitor closets.
3. Walls within 24 inches of centerline of drinking fountains, isolated wall-hung lavatories, and countertop sinks and other similar water sources.
4. Interior face of exterior walls.
5. Acceptable gypsum board products for the above listed conditions:
    a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.
    b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.

D. Direct Exposure: Surfaces normally soaked, saturated, or regularly and frequently exposed to water and / or moisture including, but not limited to, the following locations:

1. Walls and ceilings in toilet rooms and bathrooms including bathtubs and showers:

a. Paint and Wall Coverings: Moisture-resistant paper-faced or moisture-resistant paperless glass-mat gypsum board.
b. Tile and Adhered Sheet/Panel Coverings: Moisture-resistant coated-glass-mat gypsum board.

3.15 GYPSUM BOARD FINISHING SCHEDULE

A. Gypsum Board Finishing Schedule, General: Finish panels to Levels of Finish indicated below. Apply joint tape over panel joints, except those with trim having flanges not intended for tape. Sand between coats and after last coat to produce a surface free of defects and ready for applied finish system.

B. Preparation: Apply joint compound at open joints, panel edges, and damaged surface areas.

C. Level 1: At following locations, embed tape at joints in joint compound unless a higher level of finish is required for fire resistance rated assemblies:

1. Ceiling plenum areas above ceilings.
2. Concealed areas.
3. Substrate for interior woodwork.

D. Level 2: At following locations, embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges:

1. Substrate for tiling.

E. Level 3: At following locations, embed tape and apply separate first and second coats of joint compound to tape, fasteners, and trim flanges:

1. Mechanical, electrical, data and elevator equipment rooms.

F. Level 4: At following locations, embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges:

1. Areas to receive paint with eggshell/flat sheen or light texture.
2. Areas to receive Type II vinyl wall coverings.
3. Areas to receive fabric wall coverings.

END OF SECTION

SECTION 09 30 13

TILING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes tile work for application to wall surfaces and including accessories, and related items necessary to complete the Work indicated.

1. Ceramic wall tile
2. Setting bed, grout, and accessories for complete installation.

B. Related Sections include the following:

1. Section 07 92 00 – Joint Sealants: For sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 09 29 00 – Gypsum Board for moisture-resistant backing board installed as part of gypsum wallboard systems.

1.02 DEFINITION

A. Large Format Tiles (LFT): Any tile with one edge greater than 15 inches.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. A108.1 - Ceramic Tile Installed with Portland Cement Mortar.
2. A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
3. A108.6 - Installation of Ceramic Tile with Chemical-Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
4. A108/A118/A136 – Specification for the Installation of Ceramic Tile.
5. A118.3 - Chemical Resistant Water Cleanable Tile-Setting and Grouting Epoxy.
6. A118.4 - Latex-Portland Cement Mortar.
7. A137.1 – Specifications for Ceramic Tile

B. American Society for Testing and Materials (ASTM):

1. C144 - Aggregate for Masonry Mortar.
2. C150 - Portland Cement.
3. C206 - Finishing Hydrated Lime.
4. C207 - Hydrated Lime for Masonry Purposes.

C. Tile Council of North America (TCNA):

1. Handbook of for Ceramic Tile Installation, current edition.

1.04 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product data for each type of product specified.

C. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with Architect.

D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

E. Samples for Verification: Of each item listed below, prepared on Sample of size and construction indicated. Where products involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on braced moisture-resistant backing board, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.

F. Grout Samples for Initial Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

1.05 INFORMATIONAL SUBMITTALS

A. Master Grade Certificates: Submit master grade certificates for each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

B. Product Certificates: Submit manufacturer's certifications for each type of grout and bonding material being provided suitable for the intended use and meet or exceed the referenced standards and the requirements of this Specification.

C. Maintenance Guide: Submit, in duplicate the tile manufacturer's maintenance instructions.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1. Install, with a minimum of 5 years of successful commercial tile installations similar in material, design, and scope to that indicated for this project.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:

1. Joint sealants.
2. Backer units.
3. Metal edge strips.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original sealed containers and as follows:

1. Labels legible and intact identifying brand name and contents.
2. Tile cartons grade-sealed by manufacturer in accordance with ANSI A137.1.
3. Grade-seals unbroken.
4. Manufactured mortars and grouts shall contain hallmarks certifying compliance with reference standards and are types recommended by tile manufacturer for application.

B. Deliver manufactured mortar and grout materials in sealed, moisture proof containers.

C. Store materials under cover in manner to prevent damage or contamination.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

B. Provide minimum 28-day cure of concrete and concrete masonry units before the installation of the tile work.

C. Maintain temperatures within range recommended by the mortar and grout manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C), in spaces during tile setting. After installation maintain temperatures within range recommended by the mortar and grout manufacturer

D. Shade all tile, materials and the work area from direct sunlight during the installation as needed to prevent rapid evaporation caused by excessive heat or wind.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers/fabricators offering products that may be incorporated into the Work include but are not limited to those listed below.

1. Tile basis of design products are indicated in the Schedule of Finishes on the drawings.

2.02 TILE PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Products and Manufacturers: Provide tile matching the Architect's samples which have been selected from the product lines and manufacturers indicated in the Schedule of Finishes.
2. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

B. Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.

C. Include special shapes, including cove bases, bullnose edges, corners, etc., required to complete the work according to best trade practice for each job condition, whether or not such special shapes are specifically indicated or specified.

D. Rectified Tile Edges: Provide all tile units having a face dimension of greater than 8" x 8" with factory rectified edges.

2.03 TILE MATERIALS

A. Basis of Design: Tile:

1. Refer to Schedule of Finishes on drawings.

B. Ceramic Tile (CT): As scheduled on drawings and as follows, unless indicated otherwise:

1. Composition: Vitreous or impervious natural clay or porcelain.
2. Thickness: 5/16 inch.
3. Face: Pattern of design indicated, with cushion edges.
4. Surface: Smooth.
5. Tile Color and Pattern: Refer to Schedule of Finishes on drawings.
6. Grout Color: Refer to Schedule of Finishes on drawings.
7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as indicated on drawings and as follows, selected from manufacturer's standard shapes.

2.04 SETTING MATERIALS

A. Source Limitations: For each tile installation, obtain compatible formulations of setting and grouting materials and waterproofing materials containing latex or latex additives from a single manufacturer.

B. Dry Set Mortar for Large and Heavy Tile (LHT Mortar): ANSI A118.4:

1. Prepackaged dry-mortar mix combined with additives to minimize slump and facilitate a thicker bond coat, and specifically manufactured and recommended in writing by the mortar and underlayment manufacturer for use in LHT mortar assemblies; one of the following:

    a. Ultraflex LFT Mortar; MAPEI Corporation.
    b. Laticrete 4-XLT; Laticrete International Inc.

2.05 GROUTING MATERIALS

A. Polymer-Modified Tile Grout (For Typical Applications): ANSI A118.7 compounded with calcium aluminate cement, non-shrinking, efflorescence free grout.

1. Polymer Type: Dry, redispersible latex/polymer powder form, prepackaged with other dry ingredients, one of the following:

    a. Prism; Custom Building Products.
    b. Permacolor; Laticrete International Inc.
    c. Ultracolor Plus FA; Mapei Corporation.

2. Colors: Refer to Schedule of Finishes on the drawings.

2.06 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions. Add materials and liquid latex additives in accurate proportions. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.07 ACCESSORY MATERIALS

A. Moisture Resistant Backerboard Units: Section 09 29 00 – Gyp[sum Board

B. Joint Sealants:

1. Typical Surfaces: "Mildew-Resistant Silicone Sealant', as specified in Section 07 92 00 – Joint Sealants.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Grout manufacturers recommended product for sealing cementitious grout joints and that does not change color or appearance of grout.

E. Metal Edge Strips for Wall Applications: Metallic, angle or L-shaped, depth to match tile and setting-bed thickness and having an integral provision for anchorage to substrate; white zinc alloy exposed-edge material; furnish in longest lengths available.

1. Manufacturers: Provide products of one of the following:

    a. Schluter Systems L.P.
    b. Blanke Corporation.
    c. Ceramic Tool Company, Inc.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
4. Verify that moisture-resistant backing board is installed in accordance with the manufacturer's installation instructions, firmly supported and fastened, and installed with fiberglass reinforcing tape at joints between panels completely embedded in thin-set mortar.
5. Where cementitious tile backing board is indicated as substrate for wainscot, ensure that backing board has been properly shimmed to align with gypsum board above.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION – GENERAL

A. Use products in strict accordance with recommendations and directions of manufacturer.

B. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in “Specifications for Installation of Ceramic Tile” that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

C. TCNA Installation Guidelines: TCNA’s “Handbook for Ceramic Tile Installation.” Comply with TCNA installation methods indicated in ceramic tile installation schedules.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

E. Finished Surfaces: Unless otherwise accepted in the sample installation(s), if any, finished surfaces shall present a flat, even appearance, free from waver, projections, and depressions.

F. Metal Edge Strips: Install where exposed edge of wall tile meets, terminates, or overlays other wall finishes that finish flush with or below face of the tile, and the manufacturer of the field tile does not manufacture a tile edge transition trim. Provide metal edge strips as full length single units. Miter corners and smooth sharp edges.

3.03 WALL TILE INSTALLATION

A. Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCNA installation methods related to types of construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Latex Portland Cement Mortar Installation (using specified latex portland cement mortar material): ANSI A108.5.
2. Glass-mat, water-resistant, Gypsum Wallboard, Interior (Latex Portland Cement Mortar) Method: TCNA W245, place tiles maintaining 1/8-inch (3-mm) wide joints, and true accurate pattern as shown.
3. Moisture-resistant backing board (Latex Portland Cement Mortar) Method: TCNA W244C, place tiles maintaining 1/8-inch (3-mm) wide joints, and true accurate pattern as shown.
4. Grout Installation: Do not begin grouting tiles until they are firmly set and, in no case, in less than 48 hours after they have been installed. Remove spacers, if any, prior to grouting. Comply with Latex-portland cement: ANSI A108.10. Fill joints of cushion edged tile to the depth of the cushion; fill joints of square edge tile flush with the tile surface. Do not permit mortar, mounting mesh, or spacer material to show through grouted joints. Provide hard finished grout, which is uniform in color, smooth, and without voids, pinholes, or low spots. Tool surfaces with shallow concave profile.

3.04 GROUTING

A. Grouting shall be installed in accordance with ANSI A108.10 and the manufacturer's recommended procedures and precautions during application and cleaning, unless noted otherwise

B. Grout tile to comply with the requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

C. Remove excess grout from tile surfaces in accordance with the grout and tile manufacturer's recommendations. Do not use excess amounts of water.

D. Rinse tilework thoroughly with clean water before and after using chemical cleaners.

E. Protect adjacent surfaces from damage caused by cleaning agents. Do not use cleaners which would damage tile or grout surfaces.

F. Do not grout joints indicated to receive sealants, including inside right angle corner joints between floors and walls of column bases. Grout joints perpendicular to expansion joints shall be finished flush with tile edges.

3.05 CURING

A. Cure installation in accordance with the grout manufacturer's recommendations. Protect tile and grout during curing operations.

B. Test cured grout, in the presence of the Architect, to confirm complete and proper hydration.

3.06 CLEANING AND PROTECTING

A. Cleaning: On completion of placement, grouting and stripping, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer’s written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.07 CERAMIC TILE WALL INSTALLATION SCHEDULE

A. Ceramic Tile Wall Installation: Where ceramic tile is installed over moisture-resistant backing board, comply with the following:

1. Installation Method: TCNA W244: For thinset over tile backer board.

a. Tile Type: As indicated.
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Polymer-modified unsanded grout.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Acoustical lay-in panel ceilings and exposed suspended metal grid ceiling system.
2. Perimeter trim and accessories.

B. Related Sections:

1. Interior Finish Schedule on the drawings
2. Division 23 – Air Diffusion Devices in Ceiling System.
3. Division 26 – Lighting Fixtures in Ceiling System.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittals Procedures.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.
    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/8 inch = 1 foot

C. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

D. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

E. Reflected ceiling plans illustrating location of each access panels with identification of the type of access panel, as coordinated in the field with the Architect.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and address, names and addresses of Architects and Owner, and other information specified.

B. Certification: Manufacturers certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry and approved independent laboratory classification or NRC, CAAC and AC.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed acoustical ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling tile from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Fire-Test Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:

1. Fire Resistance Rating: Test in accordance with ASTM E 119, UL Classified and listed in UL "Fire Resistance Directory."
2. Refer to Fire Resistance Directory for specified UL Design Number and related assembly construction data.
3. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A material as determined by testing identical products in accordance with ASTM E 84.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Areas receiving ceiling work shall be broom-clean and uninterrupted for free movement of rolling scaffold.

1.07 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.08 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Refer to Interior Finish Schedule on drawings for Basis of Design manufacturer and product.

1. Basis of Design: Finish Code Designation: **AC-**

B. Subject to compliance with requirements, provide the products listed in the following Part 2 Articles or a comparable product by one of the following manufacturers:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.
3. Certainteed

C. Suspension Products: Provide one of the following:

1. Specifications based on Armstrong (15/16-inch) exposed tee grid system. Comparable product of the following named manufacturers will be acceptable.
2. Armstrong, Inc.
3. USG Interiors, Inc.
4. Chicago Metallic Corporation

2.02 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING SYSTEM

A. Acoustical Panels (finish designation **ACT-1**):

1. Type, Form, and Finish: Provide Type A5, Form 2, Pattern C E units in accordance with ASTM E1264 with factory applied latex painted white finish.
2. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.88.
3. Flame Spread: ASTM E 1264; Fire Resistive Class A, Flame Spread less than 25.
4. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.75
5. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35.
6. Edge Profile: SLT.
7. Panel Size: 24 inches by 24 inches by 3/4-inch thickness.
8. Mold/Mildew Inhibitor: The product shall be treated with a paint that contains a biocide that inhibits or retards the growth of mold or mildew, ASTM D 3273.

B. Acoustical Panels (finish designation **ACT-2**):

1. Type, Form, and Finish: Provide Type IX, Form 2, Pattern G units in accordance with ASTM E1264 with factory applied latex painted white finish.
2. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.89.
3. Flame Spread: ASTM E 1264; Fire Resistive Class A, Flame Spread less than 25.
4. Noise Reduction Coefficient (NRC): N/A
5. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 33.
6. Edge Profile: SLT.
7. Panel Size: 24 inches by 24 inches by 5/8-inch thickness.
8. Mold/Mildew Inhibitor: The product shall be treated with a paint that contains a biocide that inhibits or retards the growth of mold or mildew, ASTM D 3273.

2.03 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Components: Main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) in accordance with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel in baked polyester paint.

1. Structural Classification: ASTM C 635, Heavy Duty.
2. Color: Painted to match the color of the selected ceiling panels unless noted otherwise.
    a. Grid Finish: Factory applied baked polyester paint finish; Color: White.
3. Grid Materials: Commercial quality steel with hot dipped galvanized coating.
4. All main runners and cross tees must bear appropriate UL Classification Markings.
5. Attachment Devices: Size for 5 times design load indicated in ASTM C635, Table 1, direct-hung, unless otherwise indicated.

B. Wire for Hangers and Ties: Zinc-coated carbon-steel wire, ASTM A641 Class 1 zinc coating, soft temper. Select wire diameter so its stress at three times hanger design load (ASTM C635, Table 1, direct-hung) will be less than yield stress of wire, but provide not less than 12 gauge-diameter wire.

C. Sheet Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

D. Support Channels and Hangers: Galvanized steel, size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1. Accessories: Hanger clips, splices, and hold down clips required for suspended grid system.

2.04 MISCELLANEOUS MATERIALS

A. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission. Refer to Section 07 92 00 – Joint Sealants.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affection performance of acoustical tile ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION OF SUSPENSION SYSTEM

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Unless otherwise shown on the Drawings or required by the systems manufacturer's printed installation instructions, install hangers 4 ft. o.c. in rows 4 ft. apart.
3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member.
8. Ceiling Grid: Install direct hung ceiling grid system to the ceiling panel model sizes shown on the Drawings and in accordance with the manufacturer's printed installation instructions.
9. When extending existing acoustical ceiling within a room, match existing grid pattern. Discontinuous grid patterns are prohibited.

C. Install edge molding and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units.

1. Provide mitered corners with edge molding.
2. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
3. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.
4. Do not use expose fasteners, including pop rivets, on moldings and trim.
5. Paint cut edges of molding and trim after installation; match color of grid using coating recommended in writing for this purpose by suspension system manufacturer.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

1. Coordinate location of suspension system to facilitate access to cable trays located above the ceiling, while respecting the layout of lighting and other ceiling penetrations. Access to trays should occur directly adjacent to the tray. Ceiling panels directly below the tray will not remove for access.
2. Align new suspension system with existing system that is to remain.

E. Coordinate the locations of upward ceiling access panels and downward ceiling access panels in the field with other disciplines and the Architect. Identify each access panel with a small black dot discreetly located and securely attached to the ceiling.

3.04 INSTALLATION OF PANELS

A. Install lay-in acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Scribe or cut panels to fit accurately at penetrations.
2. Arrange directionally-patterned acoustical panels as indicated on reflected ceiling plans.
3. Use procedures that will minimize damage or soiling of the units during installation. Replace units which are damaged or cannot be adequately cleaned, as directed by the Architect at no additional cost to the Owner.
4. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
5. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
6. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
7. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
8. Comply with UL Design Number for acceptable component and hanger wire spacing, number and size of acoustical panels, fixture protection and other installation requirements.
9. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated required.
10. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.05 TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.06 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. Protect acoustical ceilings during the construction period so that they will be without any indication of deterioration or damage at the time of acceptance by Owner.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes resilient base and flooring transition strips.

B. Related Sections/Drawings:

1. Schedule of Finishes on the drawings.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product specified, describing physical and performance requirements, sizes, patterns, and colors available.

1.03 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by manufacturers of resilient wall base and accessories certifying that each product furnished complies with requirements.

B. Maintenance Data: Include in operating and maintenance manual specified in Section 01 77 00 – Closeout Procedures.

1.04 QUALITY ASSURANCE

A. Provide each type of resilient accessory as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

B. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

C. Materials shall be from a single production run and indicated on the carton label bearing the manufacturers color code. The color shall be uniform throughout.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing name of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 degrees F (10 and 32 degrees C).

C. Move products into spaces where they will be installed at least 48 hours before installation, unless manufacturer recommends longer conditioning period in writing.

1.06 PROJECT CONDITIONS

A. Install base and accessories after other finishing operations, including painting, have been completed.

B. Maintain a temperature of not less than 70 degrees F or more than 95 degrees F in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 degrees F or more that 95 degrees F.

C. Do not install products until they are at the same temperature as the space where they are to be installed.

D. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Refer to plans for manufacturers and products.

B. Wall Base:

1. Basis of Design: Mannington
2. Acceptable Manufacturers:

   a. Forbo
   b. Roppe

C. Metal Transition Strips:

1. Basis of Design: Schluter Systems

2.02 THERMOSET RUBBER WALL BASE

A. Manufactured from a proprietary thermoplastic rubber formulation.

B. Product Criteria: Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1 and the following.

1. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm2 or greater, Class I.
2. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
3. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1 1/4" diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.
4. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.

C. Minimum Thickness: 5/16 inch

D. Height: 6 inch.

E. Coved at resilient tile and concrete, straight at carpet.

F. Base Accessories: Premolded end stops and external corners of same material, size and color as base.

2.03 METAL TRANSITION STRIPS

A. Basis of Design: Schluter Systems of Platsburgh, NY.

2.04 INSTALLATION ACCESSORIES

A. Primers and Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing substrate underlayment and site conditions.

3.02 PREPARATION

A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do no proceed with installation until unsatisfactory conditions have been corrected.

3.03 RESILIENT ACCESSORY INSTALLATION

A. General: Install resilient accessories according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
3. Do not stretch base during installation.
4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
5. Preformed corners: Install preformed corners if available before installing straight pieces.
6. Job-formed corners: (Inside corners only)

    a. Inside corners: Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
2. Sweep or vacuum floor thoroughly.

B. Protect accessories against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by product manufacturer.

END OF SECTION

SECTION 09 65 16

RESILIENT SHEET FLOORING AND ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Vinyl sheet flooring as shown on the drawings and schedules and as indicated by the requirements of this section.
2. Resilient accessories.

B. Related Sections:

1. Section 09 05 61 – Common Work Results for Flooring Preparation

1.02 REFERENCES

A. ASTM International:

1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
4. ASTM F 1913 Standard Specification for Sheet Vinyl Floor Covering without Backing
5. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
6. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product.

1. For adhesives and chemical-bonding compounds, include printed statement of VOC content in g/L.

C. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions.

1. Show details of special patterns.
2. Indicate transition details to other flooring materials.

D. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 12 inch x 12 inch sections.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

E. Samples for Verification: In manufacturer's standard size, but not less than 3-by-3-inch sections of each different color and pattern of resilient sheet flooring required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

F. Product Schedule: For resilient flooring and accessories. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient flooring product and accessory to include in maintenance manuals.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

B. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products according to test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested according to ASTM E648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested according to ASTM E662.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing name of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 degrees F (10 and 32 degrees C).

C. Move products into spaces where they will be installed at least 48 hours before installation, unless manufacturer recommends longer conditioning period in writing.

1.08 PROJECT CONDITIONS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 100ºF (38ºC) for at least 48 hours before, during, and for not less than 48 hours after installation.

B. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Refer to product installation recommendations for a complete guide on project conditions

C. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F.

D. Close spaces to traffic during rand for 48 hours after resilient sheet flooring installation.

E. Install resilient flooring products after other finishing operations, including painting, have been completed.

1.09 WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

1. Limited Warranty Period: 10 years.

PART 2 – PRODUCTS

2.01 VINYL SHEET FLOORING

A. Provide Homogeneous Sheet Flooring: .

1. Description: An unbacked, nonlayered, homogeneous sheet vinyl flooring. Protected by a diamond-infused UV-cured polyurethane finish, the colors and pattern detail are dispersed uniformly throughout the thickness of the product. Color pigments are insoluble in water and resistant to cleaning agents and light.

2. Homogeneous sheet flooring shall conform to the requirements of ASTM F1913 Standard Specification for Sheet Floor Covering Without Backing.
3. Pattern and Color: Schedule of Finishes on drawings.
4. Width: 6 ft. 5 in.
5. Length: up to 65.62 ft.
6. Thickness: 0.080 in.

B. Weld Rod:

1. Provide solid color vinyl weld rod as produced by manufacturer and intended for heat welding of seams.
2. Color shall be compatible with field color of flooring or as selected by Architect. Color selected from the range currently available from manufacturer.

C. Seam Adhesive: Provide manufacturers recommended seam adhesive at seams as recommended by the resilient flooring manufacturer.

D. Products: Subject to compliance with requirements, provide products indicated in Finish Schedule on Drawings.

2.02 COVE BASE MATERIALS

A. For integral flash cove base: Provide integral flash cove wall base by extending sheet flooring 6 in. up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer.

2.03 INSTALLATION MATERIALS

A. For patching, smoothing, and leveling monolithic subfloors

1. Manufacturers recommended underlayment and leveler.

B. Primer: Manufacturer recommended acrylic primer for porous substrates.

C. Moisture Mitigation: Manufacturers two-part moisture mitigation system.

D. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

E. Provide top edge trim caps of plastic for integral flash cove as approved by the Architect.

F. Provide transition/reducing strips tapered to meet abutting materials.

G. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl, or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

H. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage or overlap.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Prepare flooring substrates according to resilient flooring product manufacturer's written instructions to ensure adhesion of resilient flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring product manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Prepare seams and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.

J. Integral-Flash-Cove Base: Cove resilient sheet flooring 6 inches up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Ensure that sheet flooring material is not stretched to span unsupported above cove strip. Butt at top against cap strip.

1. Heat-weld seams as specified for those on the floor.
2. Form external corners using a butterfly piece or v-plug of flooring material. Heat material to shape needed.
3. Cut inside corners at a 45-degree angle on the wall.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Fill voids with plastic filler along the top edge of the resilient cove cap.

C. Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Contract Completion.

E. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

F. Clean floor surfaces not more than four days before dates scheduled for inspections intended to establish date of Contract Completion in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes surface preparation and field painting and finishing of interior and exterior surfaces including:

1. Scheduled and otherwise identified surfaces.
2. Exposed surfaces including exposed interior piping, ducts, and conduit.
3. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified in other sections, and include sealers, primers, stains, fillers and other applied materials used as prime or intermediate coats.

B. Related Sections/Drawings:

1. Schedule of Finishes and Legend on drawings.
2. Section 09 96 00 – High Performance Coatings

C. Interior items and surfaces not requiring painting, unless noted otherwise:

1. Where specifically omitted.
2. Items and surfaces permanently concealed in inaccessible areas such as above ceilings; including pipe, pipe covering, hangers, and conduit.
3. Prefinished or naturally finished items such as exposed ornamental metalwork, sheet metal work, bronze, stainless steel, aluminum, and other prefinished materials.
4. Labels, including code-required labels, equipment name, identification, performance rating or nomenclature plates.
5. Operating parts.
6. Surfaces where finishing is specified under other sections of the specifications.
7. Items with factory applied finishes.
8. Moving parts of operating units.
9. Acoustical ceilings.

D. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically describe a particular item or a surface for a coating or color, paint the item or surface the same as similar adjacent equipment, materials or surfaces. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

1.02 DEFINITIONS

A. "Paint" as used herein means coating system materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

B. Conform to PDCA Glossary for interpretation of terms used in this Section except as modified below.

1. EXPOSED SURFACES: Surfaces of products, assemblies, and components visible from any angle after final installation. Includes internal surfaces visible when operable doors, panels or drawers are open, and surfaces visible behind registers, grilles, or louvers.
2. CONCEALED SURFACES: Surfaces permanently hidden from view in finished construction and which are only visible after removal or disassembly of part or all of product or assembly.
3. INACCESSIBLE SPACES: Spaces not intended for human use.
4. Spaces listed below are defined as CONCEALED or INACCESSIBLE:

a. Space between suspended ceilings and floor or roof construction above.
b. Inside furred spaces.

c. Inside of partitions
d. Mechanical and electrical items enclosed within casework or equipment.
e. Foundation spaces.
f. Crawl spaces.
g. Trenches and manholes.
h. Mechanical shafts or chases.
i. Enclosed elevator shafts (unless otherwise noted)
j. Utility tunnels.

1.03 COLOR SCHEDULE

A. Schedule:

1. Obtain schedule in advance of commencing work.
2. Omissions in the color schedule shall not relieve the Contractor from performance in accordance with requirements of the Contract Documents.
3. Obtain Architects color, texture and sheen approval for painting unscheduled surfaces, if any.

1.04 ACTION SUBMITTALS

A. Prepare submittals in accordance with Section 01 33 00 –- Submittal Procedures.

B. Product Data:

1. Submit complete schedule of products proposed for use, by brand name and/or number including manufacturer's label analysis and description of products and their suitability for intended use for approval.

   a. Identify each material by manufacturer’s catalog number, product name, and generic classification.
   b. Include typewritten list identifying paint systems and colors applied to each room, space, or item.

2. Specifically include percent solids by volume, VOC content (pound/gallon).

C. Samples for Color and Sheen: Prepare one sample of each opaque finish paint specified in each color and sheen scheduled for appearance verification.

1. Apply to 12 inch by 12 inch by ¼ inch hardboard. Apply sufficient paint thickness to provide proper hiding and appearance.
2. Label each sample to indicate material, color, by color formulation designation, and sheen.
3. On one-half of the sample show the completed treatment, and on the other half show the successive steps taken in producing the finish.

   a. Step back each coat and process at least on inch to show bare substrate and each coat and process in system build-up.
   b. Label each sample to indicate materials, color sheen, DFT or each coat applied, and total system DFT.

4. Approved samples will be so marked; one set will be returned for the painter's use.
5. Approved samples shall be standard of finish and color to be selected.
6. No finishes shall be applied on the work until samples are approved.

D. Informational Submittals: Submit the following separate for other submittals:

1. Certification specified in Quality Assurance article.
2. Manufacturer’s instructions.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Single Source Responsibility: Provide products of a single manufacturer for use in each paint system. Do not mix product of different manufacturers without approval of Architect and manufacturers involved.

1.06 PRECONSTRUCTION CONFERENCE

A. Conduct pre-installation conference in accordance with Section 01 31 00 – Project Coordination.

B. Conference attendance by Owner, Architect, Contractor, Installer, and manufacturer's representative authorized to certify Installer as an approved applicator.

C. Tentative agenda:

1. Discuss sequence and scheduling, installation procedures and interface with other trades.
2. Review requirements and conditions which could possibly interfere with successful performance of work.
3. Preview project specification and drawings.
4. Review basis and coordination to determine acceptability of surfaces to receive paints and coatings.
5. Review environmental and ventilation requirements.
6. Where required by warranty requirements, include scheduling requirements for manufacturer representative to confirm acceptability of surfaces. Include surface preparation to receive paints and coating, acceptable application methods and techniques for painting and coating, and acceptable completion of work to permit issuance of warranty.

1.07 FIELD SAMPLES

A. Field Quality Control: Provide benchmark samples of paint coatings under provisions of Section 01 43 30 – Mockups.

B. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Duplicate finish of approved drawdown and Verification Sample submittals.

1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Finish the area in accordance with specification requirements for applicable substrate surfaces and items.
    a. Ceiling and Wall Surfaces: Provide field sample panel of minimum 100 square feet in size for wall and ceiling surfaces
    b. Small Areas and Items: The Architect will designate an item or area as required.
2. Apply Benchmark Samples, according to requirements for the completed Work. Provide required sheen, color, texture, color intensity, and technique on each surface.
    a. A color will be selected from the color palette to be used in the project.
    b. After finishes are accepted, Architect will use the surface to evaluate coating systems of a similar nature.
3. After temporary lighting and other environmental services have been activated, apply coatings to each surface according to the Paint and Coatings Schedules at the end of this section. Provide required sheen, color, and texture on each surface.
    a. After finishes of mockups are accepted by the Architect, the Architect will use the approved mockup as the project standard for painting and coating work.
4. Execute all work under favorable conditions suitable for the production of good, durable work.
5. Acceptance will be based on a final inspection of work by the Architect made at one time.
6. Final approval of colors will be from job-applied samples.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 60 00 – Product Requirements.

B. Deliver materials in sealed containers, premixed and packaged by the manufacturer (or his authorized distributor), bearing the manufacturer's standard label showing trade name and number, label analysis, and directions for use.

1. Label containers to indicate manufacturer's name, Product name and type of paint, brand code or stock number, date of manufacturer, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

2. Do not open containers until contents are to be used.

C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F and maximum 90 degrees F. Maintain containers used in storage in a clean condition, free of foreign materials and residue, and with labels maintained in legible condition.

D. Upon completion of work, leave storage area clean and in same condition as remainder of work.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Environmental Conditions: Comply with the more restrictive of the following or manufacturer's requirements under which systems can be applied.

1. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures within specified limits and to exhaust hazardous fumes.
2. Maintain temperature and humidity conditions for minimum 24 hours before, during, and 48 hours after application of finishes, unless longer times are required by manufacturer.
3. Do not permit wide variations in ambient temperatures which might result in condensation on freshly coated surfaces.
4. Apply water-based paints only when surface temperature and surrounding air temperatures in each room are between 50 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.
5. Apply solvent-thinned paints only when surface temperature and surrounding air temperatures in each room are between 45 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

B. Do not apply interior coatings under any of the following conditions:

1. When surface is not within the allowable moisture content as permitted by the paint manufacturer.
2. When relative humidity is less than 20 percent or exceeds 85 percent.
3. When temperature is less than 5 degrees F above dew point.
4. When dust may be generated before paints have dried.

C. Provide lighting level of 80 foot candles measured mid-height at substrate surface during application of paints.

1.10 COORDINATION

A. Review other section specifying prime coats to ensure compatibility of the total paint system for various substrates.

1. Upon request from other trades, furnish information on characteristics for finish materials proposed for use to ensure compatibility of various parts.
2. Test compatibility of existing coating, including shop applied primers and previously applied coating, buy applying specified paint to small, inconspicuous area.
3. If specified paint lifts or blisters existing coating, apply barrier or tie coat as recommended by paint manufacturer.
4. If no compatible barrier or tie coat exists, remove existing coating completely and apply paint system as specified for new work.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Except for any special coatings specified or indicated elsewhere, provide painting products of one of the following manufacturers:

1. Basis of Design: Sherwin-Williams Co., Cleveland, OH
2. Benjamin Moore & Co., Montvale, NJ
3. PPG Paints, PPG Industries, Pittsburgh, PA

2.02 PAINT MATERIALS

A. General:

1. Provide manufacturer's first line professional quality paint/ coating materials for the coating systems specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
2. Paints: Ready-mixed, factory tinted, with the following characteristics:

   a. Fully ground pigments to maintain soft paste consistency in vehicle.
   b. Capable of being dispersed into uniform, homogeneous mixture.
   c. Possess good flowing and brushing properties.
   d. Capable of drying or curing free of streaks or sags, and yielding specified finish.
   e. Paints formulated with formaldehyde, halogenated solvents, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI and their oxides not allowed.

      1) Water Based Paints formulated with aromatic hydrocarbons (organic solvent with benzene ring in its molecular structure) not allowed.
      2) Solvent Based Paints formulated with more than 10 percent aromatic hydrocarbons by weight not allowed.

2.03 ACCESSORY MATERIALS

A. Muriatic Acid, Mildewcide, TSP (Tri-Sodium Phosphate), Acidic-Detergent, Zinc Sulfate, Sodium Metasilicate, And Solvent: Commercially available, non-damaging to surface being cleaned; as specified in PDCA Specification Manual; acceptable to paint manufacturer.

B. Metal Conditioner: Proprietary phosphoric acid based, etching type solution; acceptable to paint manufacturer.

C. Rust Inhibitor: Water containing 0.32 percent of sodium nitrite and 1.28 percent by weight of secondary ammonium phosphate (dibasic); or water containing 0.2 percent by weight of chromic acid or sodium chromate or sodium dichromate or potassium dichromate.

D. Compounds: Spackling compound, putty, plastic wood filler, liquid de-glosser, latex patching plaster, latex base filler, thinners, and other materials not specifically indicated but required to achieve finishes specified. Pure, of highest commercial quality, compatible with paints and acceptable to paint manufacturer.

E. Provide related materials, such as linseed oil, shellac, turpentine, or other accessory materials of the highest quality approved for use by the manufacturer of the paint and used within paint manufacturers recommended limits.

2.04 MIXING

A. Use factory prepared colors matching approved samples. Site tinting is not permitted.

1. Thoroughly mix and stir paints before use to ensure homogeneous dispersion of ingredients. Prior to application, blend multiple containers of same material and color by pouring from one container to another several times to ensure uniform consistency, color, and smoothness.
2. Mix only in clean mixing pails of material recommended by manufacturer to avoid contamination.
3. Remove film which may form on surface of material in containers and strain material before using. Stir frequently during use to maintain pigments in suspension. Do not stir film into material.
4. Apply paints of consistency recommended by manufacturer. Thin only within recommended limits using thinners approved by paint manufacturer.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine substrates, areas, and conditions, with the applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of anticipated problems in application, system specifications, or possible incompatibility of coatings over substrates which are pre-primed or primed by others.

C. Notify Architect a minimum of one working day prior to painting about possible problems resulting from using the specified materials over previously finished substrates.

D. Conduct alkali testing with litmus paper on exposed plaster, cementitious, surfaces, and do not begin painting if surfaces exceed alkalinity allowed by paint manufacturer.

E. Test moisture content of surfaces using an electronic moisture meter. Do not begin application of coatings unless moisture content of exposed surfaces is below the following maximum values:

1. Gypsum Wallboard: 12 percent.
2. Plaster: 12 percent.
3. Finish Woodwork: 7 to 10 percent moisture content.
4. Wood Surfaces: 15 percent.
5. Vertical Concrete Surfaces: 12 percent.
6. Horizontal Concrete Surfaces: 8 percent.

F. Coordination of Work: Review other sections in which primers are specified to ensure compatibility for the total system with various substrates.

3.02 SURFACE-PREPARATION FOR NEW PAINTED SURFACES

A. General: Use the cleaning methods specified in this article, using the gentlest appropriate method necessary to clean the surface.

B. Wash surfaces by hand cleaning using clean rags, sponges, water, and detergent.

C. Hand-Tool Cleaning: Use wet sanding and wet scraping methods only. Lightly mist substrate before sanding or scraping. Acceptable hand-tools include scrapers, wire brushes, sandpaper, steel wool, nonmetallic pads, and dusters. Because of varying substrates, selection of tools shall be the responsibility of Contractor. After hand-cleaning is attempted, power tool cleaning may be required to complete cleaning and surface preparation.

D. Solvent Cleaning: Solvent cleaning may be used to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before preparation work begins. In addition, if necessary, spot-solvent cleaning may be employed just prior to the commencement of paint application, provided enough time is allowed for complete evaporation. Clean solvent and clean rags shall be used for the final wash to ensure that all foreign materials have been removed.

E. General:

1. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
2. Protect elements surrounding the work of this section from damage or disfigurement. Provide drop cloths, shields, and protection methods to prevent spray or droppings from disfiguring other surfaces.
3. Protect floors and adjacent work and materials. Remove and properly place temporary protection and coverings removed from the work area. Repair damage to other surfaces caused by work of this section.
4. Remove empty paint containers from the site. Dispose in accordance with local disposal requirements.

F. Clean and prepare substrate surfaces in accordance with manufacturer's instructions for each particular substrate condition. Remove oil and grease before mechanical cleaning. Clean and correct defects and deficiencies in substrate surfaces to be painted before applying paint or finish treatments.

1. Do not paint over dirt, rust, scale, grease, oil, moisture, or marred surfaces, mildewed surfaces or other conditions detrimental to formation of a durable paint film.
2. Correct minor defects and clean surfaces which affect work of this Section.
3. Seal marks which may bleed through surface finishes.
4. Remove mildew by scrubbing with solution of tri-sodium phosphate and bl0each solution. Rinse with clean water and allow surface to dry thoroughly.
5. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

G. Shop Primed Steel and Ferrous Metal Surfaces:

1. Bare Metal Solvent Cleaning: Clean with solvents to remove oil, grease, and other contaminants before other cleaning treatments are used. Do not use solvents, including primer thinner and turpentine, which leave residue.
2. Shop Primed Steel Surfaces: Surfaces shall be clean and dry. Fill any open joints or deep abrasions in shop prime coat with filler, feather edges, sand smooth, and touch-up with metal primer compatible with shop primer, extending primer beyond treated area.
3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces; remove rust, oil, grease, dirt, and other foreign substances. Use removal or cleaning methods that comply with paint manufacturer's written recommendations.
    a. Touch up bare areas and prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as shop coat.
4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents until surfaces are free of oil and surface contaminants.
    a. Pretreat surfaces prior to application of prime coat with phosphate pretreatment. Strictly follow manufacturer’s directions as to cleaning prior to treatment, application of treatment, and after-rinse.
    b. Thoroughly clean all surfaces receiving directly applied prime coat with solvent or chemical washes, to remove oil, grease and other film. Wipe dry with clean cloths. Prime with zinc oxide primer.
5. Conditioner (Apply to Bare Metal): Apply phosphoric acid-based, etching-type surface treatments after solvent cleaning and according to manufacturers' written instructions. Rinse with clear water when reaction is complete. Allow at least 15 to 30 minutes but not less time than recommended by manufacturer for metal conditioner to condition the metal surface. Do not allow conditioner to dry before rinsing. If white rust (zinc oxide) appears after drying, wash clean with denatured alcohol immediately before priming.

H. Monolithic Concrete:

1. Prepare surfaces by removing efflorescence, chalk, dust, dirt, grease, oils, and release agents dirt, dust, loose mortar, scale, salt or alkali powder, and oil or grease stains. Cracks, abrasions, and other defects shall be cut out, patched flush, and sanded smooth and sealed before applying prime coat.
    a. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before applying paint.
2. Cementitious Materials: Prepare concrete surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

I. Wood to Receive Painted Finish:

1. Wood to be painted shall be back-primed on sides and edges. Use wood primer for back-priming, where opaque finish is specified.

2. Sand to a smooth even surface and then dust off. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
    a. Coat knots, sap and pitch streaks with Knot Sealer before applying paint.
    b. Apply two coats of Knot Sealer over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with Wood Filler Paste, colored to match wood color.
    a. Thin filler in accordance with manufacturer's instructions for application.
    b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

J. Gypsum Board:

1. New gypsum board must be clean and dry. All nail heads must be set and spackled. Joints must be taped and spackled and finished with joint compound. All dust must be removed prior to painting.
2. Rout out surface cracks to remove loose, unsound material; fill with patching compound and wet sand; spot-prime with specified primer.

3.03 PROTECTION AND MASKING

A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be finished and that have not been removed by others. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and finishing. After completing finishing operations in each space or area, reinstall items removed unless otherwise indicated.

B. Take particular care to protect the following:

1. Adjacent surfaces.
2. Masonry surfaces.
3. Metal surfaces.
4. Wood surfaces.

C. Protect elements to retain their original finishes from damage by paint or paint removal products. Mask, tape, and take great care when applying finish materials to areas adjacent to original finishes. Mask off building elements and equipment not to be finished with masking film or polyethylene sheeting adhered with preservation tape.

D. Safeguard the building’s lighting fixtures, floors, decorative art glass, stonework and equipment and materials to remain.

E. Protect areas retaining their original finishes from damage and overpaint.

F. Protect the work of other trades against any overpainting, marring, masking residue, or other damage.

G. If accessibility to surfaces is restricted, it is the paint contractor’s responsibility to request that the obstructing materials be moved.

H. All trades shall be responsible for making good any damage for which they are responsible. Correct damage by cleaning, repairing, or replacing, and repainting, as acceptable to the Architect.

3.04 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied. Coat all surfaces specified, scheduled, illustrated, and otherwise exposed unless specifically noted otherwise.

1. Apply paint of type, color, and sheen as scheduled.

2. Number of coats specified is the minimum number acceptable.
3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
4. Provide finish coats that are compatible with primers used.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
7. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish doors on tops, bottoms, and side edges the same as face surfaces.
10. Finish edges of paints adjoining other materials or colors sharp and clean, without overlapping.
11. Provide specified primer and finish coats on all surfaces of window frames and stops. Concealed ends and edges of window sashes are to receive primer and first coat of finish.
12. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
13. Sand lightly between each succeeding enamel or varnish coat.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the room treatment schedule or the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate a paint coating system for a particular substrate, defer to the Architect for selection of finish system and color.

1. Items such as doors and door frames that are exposed on two faces and which occur between two rooms or spaces are to be finished/ painted on both sides unless otherwise noted.
2. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
3. At any surface which is not scheduled to be painted, but which has been affected by cutting and patching or selective demolition, paint the surface with the pertinent coating system for the substrate type as scheduled in this section to the extent of the surface area. At walls, to inside or outside corners of the affected area; at ceilings to the extent of the ceiling area in each space.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted with compatible materials.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

D. Application Methods: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Apply paint systems to total dry film thickness scheduled. Apply material at not less than manufacturer's recommended spreading rate. Do not exceed maximum single coat thickness recommendation by paint manufacturer. Do not double-back with spray equipment by building up film thickness of two coats in one pass. Ensure that edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent of flat surfaces.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Motors and mechanical equipment.
7. Accessory items.
8. Shop primed equipment.
9. Shop primed finish items such as louvers, grilles, covers and other similar items.

B. Electrical items to be painted include, but are not limited to, the following:

1. Conduit, boxes and fittings.
2. Switchgear.
3. Panelboards.

C. Refer to Divisions 21, 22, 23, and 26 for schedule of color coating and identification banding of equipment, ductwork, piping, and conduit.

D. Paint shop primed equipment.

E. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately. Metal and/or plastic devices such as exposed raceways, fire horn and strobe, diffuser and grilles, radiators and cabinet heaters shall be spray painted.

F. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are indicated not to be finished.

G. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

H. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

I. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.06 FIELD QUALITY CONTROL

A. General: Comply with the requirements of Section 01 45 00 – Quality Requirements.

1. Periodically test film thickness of each coat with wet film gage to ensure paints are being applied to proper thickness.
2. Request review of each applied coat by Architect before application of successive coats.
3. Only reviewed coats will be considered in determining number of coats applied.
4. Immediately prior to Substantial Completion, perform detailed inspection of painted surfaces and repair or refinish abraded, stained, or otherwise disfigured surfaces.

3.07 DEFINITION OF SHEEN

A. General: Standard coating terms defined in ASTM D16 apply to this Section:

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Satin or Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

B. Sheens for surfaces to be painted in this section: are indicated in the finish schedule on the drawings:

3.08 CLEANING AND PROTECTION

A. Cleaning: Comply with Section 01 77 00 – Closeout Procedures. Promptly remove spilled, splashed, or spattered paints. Clean spots, oil, and other soiling from finished surfaces using cleaning agents and methods which will not damage materials.

1. If completed construction is damaged beyond normal cleaning or repair by painting operations, replace damaged items at no additional cost to GSA.
2. Maintain premises and storage areas free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
3. Collect waste, cloths, and material which may constitute fire hazards and place in closed metal containers; remove from site daily along with empty containers.

B. Protection: Protect finished work in accordance with Section 01 50 00 – Temporary Facilities and Controls.

1. Protect work of other trades against damage from paint activities. Correct damage by cleaning, repairing, replacing, and repaint as acceptable to the Architect.
2. Provide "Wet Paint" signs and other methods to protect newly coated surfaces. Remove when directed or when no longer needed.

3.09 EXTERIOR PAINTING SCHEDULE

A. Note: Coatings for Exterior Metal surfaces specified in Section 09 96 00 – High Performance Coatings.

B. Barn Paint:

1. Prime Coat: Per manufacturers requirements.
2. Finish Coats: 2 coats Valspar Acrylic Latex Barn & Fence Exterior Paint

3.10 INTERIOR PAINT AND COATING SCHEDULE

A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Shop Primed Metal: Interior Structural Steel, Hollow Metal Doors, Frames, and other Ferrous Metal Surfaces for semi-gloss finish: Lining of Mechanical Equipment, Convector Cabinets, Unit Ventilators or Ducts Visible Through Grilles or Louvers:

1. First Coat: Primer
   (NOTE: Primer also required on galvanized surfaces. All shop primed surfaces shall be reprimed with proper primer per manufacturer's instructions prior to applying coatings scheduled herein).
2. Interior Latex Enamel: Factory-formulated latex enamel for interior applications:

   a. 1 coat S-W; ProCryl Universal Metal Primer B66W310 Applied at a dry film thickness of not less than 3.0 mils
      2 coats S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series at 2.5 to 4.0 mils dry, per coat.
   b. 1 coat: BM Super Spec® HP Alkyd Metal Primer P06 (323 g/L)
      2 coats: BM Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L)
   c. 1 coat: PPG; Speedhide Rust-Inhibitive Steel Primer, 6-208 Series; applied at 1.5 mils minimum DFT
      2 coats: PPG; Speedhide Zero Interior Latex Semi-Gloss, 6-5510 Series; applied at 1.5 mils minimum DFT.

C. Gypsum Board Substrates: (Eggshell sheen)

1. 1 coat BM Ultra Spec 500 Interior Latex Primer N534 (0 g/L)
   2 coats: BM; Ultra Spec 500 Latex Eggshell N538 (0 g/L)
2. 1 coat PPG: "Speedhide zero Interior Zero VOC Latex Sealer 6-4900XI." (0 g/L)
   2 coats PPG: "Speedhide zero Interior Zero VOC Latex Eggshell 6-4310XI Series." (0 g/L))
3. 1 Coat: S-W ProMar 200 Interior Latex Wall Primer, B28W8200, (4 mils wet, 1.3 mils dry per coat).
   2 Coats: S-W ProMar 200 Acrylic Latex Egg-Shell Enamel B20W200, (4 mils wet, 1.6 mils dry per coat)

D. Gypsum Board Ceilings: (Flat Sheen)

1. 1 coat Benjamin Moore; Ultra Spec 500 Interior Latex Primer N534 (0 g/L)
   2 coats: Benjamin Moore; Ultra Spec 500 Interior Latex Flat N536 (0 g/L)
2. 1 coat PPG: "Speedhide zero Interior Zero VOC Latex Sealer 6-4900XI." (0 g/L)
   2 coats PPG: "Speedhide zero Interior Zero VOC Latex Flat 6-4110XI." (0 g/L)
3. 1 coat: S-W ProMar 200 Interior Latex Wall Primer, B28W8200, (4 mils wet, 1.3 mils dry per coat)
   2 coats: S-W ProMar 200 Interior Latex Flat Wall Paint, B30 Series, (4 mils wet, 1.6 mils dry per coat)

E. Wood and Hardboard: Provide the following paint finish systems over interior wood surfaces:

1. Semi-Gloss Finish: Two finish coats over a wood undercoater.

   a. 1 Coat: S-W PrepRite ProBlock Latex B51 Series: Applied at a dry film thickness of not less than 1.4 mils (4 mils wet).
      2 Coats: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series: Applied at a dry film thickness of not less than 1.7 mils per coat (4 mils wet).
   b. 1 Coat –BM Fresh Start Multi-Purpose Primer (023)
      2 coats: BM Advance Waterborne Alkyd Finish Satin (792), Semi-Gloss (793), High Gloss (794
   c. 1 coat: PPG SEAL GRIP® Interior/Exterior Acrylic Universal Primer/Sealer 17-921XI
      2 coats PPG: SPEEDHIDE® Interior Enamel Latex Semi-Gloss 6-500

F. Ferrous and Galvanized Metal at Exposed Ceiling Construction including Ductwork, Conduits, and Piping (Not less than 10 feet AFF):

Note: Verify color with Architect.

1. 1 Coat: S-W DTM Acrylic Primer/Finish B66W1: Applied at a dry film thickness of not less than 2.5 to 4 mils.
   2 Coats: S-W Waterborne Acrylic Dry Fall Eg-Shel B42W2: Applied at a dry film thickness of not less than 3.0 mils (7 mils wet)
2. 1 coat: BM: Super Spec® HP Acrylic Metal Primer P04
   2 coats: BM: "Dryfall Latex Flat 395 (46 g/L),)

3. 1 Coat: PPG PITT-TECH® Plus Waterborne DTM Acrylic Primer Finish 4020PF. Applied DFT not less than 2.5-4 mils
   2 Coats: PPG SPEEDHIDE® SUPER TECH® WB Interior 100% Acrylic Dry-Fog Eggshell Latex 6-724XI. applied not less than 3.0 mils

G. Lining of Mechanical Equipment, Convector Cabinets, Unit Ventilators or Ducts Visible Through Grilles or Louvers:

1. 2 coats SW Industrial Enamel, B54 Series; Black.
2. 2 coats BM Satin Impervo Enamel (235); Black.
3. 2 coats PPG HPC Rust Preventative High Gloss Alkyd Enamel 4309; Black

H. Exposed Insulated Piping, Ductwork, Vessels:

1. 1 coat Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils
   2 coats SW (Finish same as adjoining walls or ceiling)
2. 1 coat Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils
   2 coats BM (Finish same as adjoining walls or ceiling).
3. 1 coat Pittsburgh Paints; PPG 17-921 Seal Grip Primer
   2 coats PPG (Finish same as adjoining walls or ceiling)

I. Exposed Uninsulated Piping: Interior Semigloss Alkyd Enamel: Factory-formulated semigloss alkyd enamel for interior application.

1. 1 coat S-W Kem Bond HS Alkyd Universal Metal Primer Applied at a dry film thickness of not less than 3.0 mils
   2 coats S-W (Finish same as adjoining walls or ceiling)
2. 1 coat BM; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils
   2 coats BM (Finish same as adjoining walls or ceiling).
3. 1 coat PPG Multiprime 4360 Low VOC Alkyd Corrosion Resistant Primer. Applied at a dry film thickness of not less than 2.0 mils.
   2 coats PPG ("Finish same as adjoining walls or ceiling")

J. Interior Structural Steel: Semigloss Alkyd Enamel: Factory-formulated semigloss alkyd enamel for interior application:

1. 1 coat SW Kem Bond HS Alkyd Universal Metal Primer Applied at a dry film thickness of not less than 3.0 mils
   2 coats SW (Finish same as adjoining walls or ceiling)
2. 1 coat Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils
   2 coats BM (Finish same as adjoining walls or ceiling)
3. 1 coat PPG Multiprime 4360 Low VOC Alkyd Corrosion Resistant Primer. Applied at a dry film thickness of not less than 2.0 mils
   2 coats PPG (Finish same as adjoining walls or ceiling)

K. Mechanical and Electrical Work: Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and conduits: Coating systems as specified.

END OF SECTION

SECTION 09 93 00

STAINING AND TRANSPARENT FINISHING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes surface preparation and application of wood stains and transparent finishes on scheduled surfaces.

1. Interior surface as scheduled.

B. Related Sections:

1. Section 06 43 00 –Wood Stairs and Railings
2. Section 08 14 74 – Sliding Barn Door

1.02 DEFINITIONS

A. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: For each type of product. Include preparation requirements and application instructions.

C. Samples for Initial Selection: For each type of product indicated

D. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.

1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
2. Label each Sample for location and application area.

E. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.04 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.06 PROJECT CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F,

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in wood finish systems schedules for the product category indicated.

1. Sherwin-Williams Company.
2. Benjamin Moore & Co.
3. Glidden Professional/Flood Company.
4. PPG Industries.

2.02 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

B. Stain Colors: Match Architect's samples and as indicated in a color schedule.

2.03 WOOD FILLERS

A. Wood Filler Paste: As recommended by finish manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Wood Substrates: 15 percent, when measured with an electronic moisture meter.
2. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
4. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.02 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.

2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
3. Countersink steel nails, if used, and fill with putty tinted to final color to eliminate rust leach stains.

C. Apply wood filler paste to open-grain woods, to produce smooth finish.

3.03 APPLICATION

A. Apply in accordance with manufacturer's instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.04 CLEANING AND PROTECTION

A. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.05 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

A. Wood Substrates: Wood seating.

1. Two Finish Coats: Interior, waterborne polyurethane (satin).

a. WoodClassics Waterborne Polyurethane Varnish - Gloss A68V91 (first coat)/Satin A68F90 (second coat); Sherwin-Williams Company.
b. Benwood Stays Clear Acrylic Polyurethane Low Lustre 423; Benjamin Moore & Co.
c. OLYMPIC Premium Interior Water Based Polyurethane Clear 42786 Stain /42784 Gloss; PPG Industries.
d. Wood Pride Professional Finishes Water Based Satin Varnish 1802-0000; Glidden Professional.

B. Wood Stairs Finish:

1. Water-Based Stain System:

a. Wood Conditioner: water-based wood conditioner, for interior wood.

1) Minwax – water-based pre-stain wood conditioner.

b. Stain Coat: Stain, semitransparent, for interior wood.

1) Minwax- water based wood stain- bright & bold collection.

c. Sealer Coat: Clear

1) Minwax Ultimate Floor Finish: Shen as selected.

C. Sliding Barn Door Finish:

1. Two Finish Coats: Interior, waterborne polyurethane (satin).

a. WoodClassics Waterborne Polyurethane Varnish - Gloss A68V91 (first coat)/Satin A68F90 (second coat); Sherwin-Williams Company.
b. Benwood Stays Clear Acrylic Polyurethane Low Lustre 423; Benjamin Moore & Co.
c. OLYMPIC Premium Interior Water Based Polyurethane Clear 42786 Stain /42784 Gloss; PPG Industries.
d. Wood Pride Professional Finishes Water Based Satin Varnish 1802-0000; Glidden Professional.

END OF SECTION

SECTION 09 96 00

HIGH-PERFORMANCE COATING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Application of high performance coating systems to exterior metal and sheet metal.
2. Work includes surface preparation, priming, painting, and finishing work necessary to complete Work indicated on Drawings.

B. Related Sections: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 09 91 00 – Painting

1.02 REFERENCES

A. Publications listed herein are part of this specification to extent referenced.

B. American Society for Testing and Materials:

1. ASTM B117: Test Method for Salt Spray (fog) Testing
2. ASTM D3359: Test Method for Measuring Adhesion by Tape Test
3. ASTM D4060: Test Method for Abrasion of Organic Coatings by the Taber Abraser
4. ASTM D4585: Practice for Testing the Water Resistance of Coatings Using Controlled Condensation.

C. Society for Protective Coatings:

1. SSPC SP-1 Specification for Solvent Cleaning
2. SSPC SP-3 Specification for Power Tool Cleaning
3. SSPC PA-1 Painting Application Specification

1.03 DEFINITIONS

A. Terms PAINT or PAINTING shall in a general sense have reference to sealers, primers, stains, oil, alkyd, latex, polyurethane, epoxy, and enamel type coatings and application of these materials.

B. Dry Film Thickness (DFT): Thickness, measured in mils, of a coat of paint in cured state.

C. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:

1. Submit manufacturer's product literature describing products to be provided, giving manufacturer's name, product name, and product line number for each material.
2. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.
3. Submit technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.

    a. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.

C. Shop Drawings:

1. Submit a complete list of products proposed for use, including identifying product names and catalog numbers.

    a. Arrange in same format as Schedule of Paint Finishes below.
    b. Include applicable manufacturer's data and recommendations.

D. Samples:

1. Submit 3 samples of each color and material selected. Samples shall show bare, prepared surface and each successive coat on metal panels.
2. Label samples on back, identifying color name and number, gloss level, manufacturer, and product name.
3. Step coats on Samples to show each coat required for system.
4. Label each Sample for location and application area.
5. Sample Size: Not less than 6" x 12"

1.05 INFORMATIONAL SUBMITTALS

A. Quality Assurance Submittals:

1. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.
2. Certificates: Provide manufacturer's certification that products to be used comply with specified requirements and are suitable for intended application.
3. Manufacturer's Instructions: Submit manufacturer's installation procedures which shall be basis for accepting or rejecting actual installation procedures.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Provide products from a company specializing in manufacture of high performance coatings with a minimum of 10 years' experience.
2. Applicator shall be trained in application techniques and procedures of high performance coating materials and shall demonstrate a minimum of five (5) years successful experience in such application.

    a. Throughout duration of Work, maintain a crew of painters who are fully qualified to satisfy specified qualifications.

3. Single Source Responsibility:

    a. Coating materials shall be products of a single manufacturer.
    b. Provide secondary materials that are produced or are specifically recommended by coating manufacturer to ensure compatibility of system.

B. Regulatory Requirements: Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements at time of application.

1.07 MOCKUPS

A. Mockups: Apply mockups of coating system to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select surfaces to represent surfaces and conditions for application of each coating system specified in Part 3 and for each color chosen.

    a. Sheet Metal: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver products in manufacturer's original unopened containers. Each container shall have manufacturer's label, intact and legible. Containers shall fully identify brand, type, grade, class, and other qualifying information used to describe con- tents.
2. Include on label for each container:

    a. Manufacturer's name
    b. Type of paint
    c. Manufacturer's stock number
    d. Color name and number
    e. Instructions for thinning, where applicable

B. Storage and Protection:

1. Store materials in a protected area, away from construction activities. Restrict storage area to paint materials and related equipment.
2. Maintain temperature in area of storage between 40° F and 110° F.
3. Comply with health and fire safety regulations.
4. Remove damaged materials from Site.

1.09 PROJECT CONDITIONS

A. Environmental Requirements: Apply coating materials under conditions as follows:

1. Refer to specific product information sheets for minimum surface temperature requirements. Surface temperatures shall be at least 5°F above dew point and in a rising mode.
2. Relative humidity shall be no higher than 85%.
3. For exterior spray application, wind velocity shall be less than 15 mph.
4. Atmosphere shall be absolutely free of airborne dust.

1.10 SEQUENCING

A. Coordination: Perform work in proper sequence with work of other trades to avoid damage to finished work.

1. Where coatings are scheduled to be applied over shop applied coatings, coordinate work of such shop applied products to ensure compatibility with field applied coating systems.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Basis of Design: Contract Documents are based on products and systems specified to establish a standard of quality. Other named acceptable manufacturers/fabricators offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

1. Basis of Design: Sherwin-Williams

B. Acceptable Manufacturers: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include those named below.

1. Tnemec Company Inc
2. PPG

2.02 MATERIALS

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. Provide products of same manufacturer for each coat in a coating system.

B. Colors: Match Architect's samples to match color selected, matching specific color sequence indicated.

2.03 COATING SYSTEM AND APPLICATION

A. The primer application shall be completed prior to any surface rusting after the blast cleaning procedures.

B. The primer and finish coat may be applied by air or airless spray methods and must be done in a manner to assure no runs or sags in the coating and an overall uniform application.

C. Welds, seams and repaired areas shall be given an initial worked-in brush coat prior to full spray application of the Primer. This also apply to all areas inaccessible by spray gun, as necessary to achieve the specified dry film thickness and a surface free of imperfections.

2.04 SHOP FINISHES

A. Shop Priming:

1. Prior to application of primer, steel surfaces shall be prepared to receive coating system in compliance with specifications of Steel Structures Painting Council (SSPC) as follows:

   a. Ferrous Metals: SSPC-SP3

2. Clean surfaces of loose scale, rust, oil, dirt, and other foreign matter, immediately prior to priming. Surfaces to be coated shall be clean, dry, smooth and free from dust and foreign matter which will adversely affect adhesion or appearance.

B. Shop Applied Finishing:

1. Steel members shall be provided with one coat of organic zinc rich.
2. Apply materials at film thickness specified below by methods recommended by manufacturer in compliance with SSPC PA-1.
3. Vary slightly color of successive paint coats. Allow each coat of paint to dry thoroughly before applying succeeding coats.
4. Make finish topcoats smooth, uniform in color, and free of laps, runs, dry spray, over-spray, and skipped or missed areas.
5. Environmental conditions shall be in compliance with coating manufacturer’s printed instructions.

2.05 SOURCE QUALITY CONTROL

A. Contractor Quality Control:

1. Documents: Review Contract Documents and applicable sections of referenced standards.
2. Painting Inspection:

   a. Verify cleaning operations to surfaces are to condition specified.
   b. Verify conformance of paint to specification.
   c. Check for thickness of each coating, final thickness and holidays.
   d. Check touch-up for final finish.

3. Reports: Submit written progress reports describing tests and inspections made and showing action taken to correct nonconforming work. Report uncorrected deviations from Contract Documents.

PART 3 – EXECUTION

3.01 EXAMINATION

A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.

1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.

B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.

1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:

   a. Confirmation of primer's suitability for expected service conditions.
   b. Confirmation of primer's ability to be top coated with materials specified.

2. Notify Architect about anticipated problems before using the coatings specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and coating application so dust and other contaminates from cleaning process will not fall on wet, newly coated surfaces.

C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
2. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.

   a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
   b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this permitted in manufacturer's written instructions.

D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
3. Use only the type of thinners approved by manufacturer and only within recommended limits.

3.03 APPLICATION

A. General: Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques best suited for the material being applied.
2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
3. Provide finish coats compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

   a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.

b. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
c. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required is the same regardless of application method.

a. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
b. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
c. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.

2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.

a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
b. Brush out and work brush coats into surfaces in an even film.
c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.

a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
b. Apply each coat to provide the equivalent hiding of brush-applied coats.
c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.

D. Minimum Coating Thickness: Apply each material no thinner than manufacturers recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.

1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.

F. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.04 CLEANING

A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

3.06 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Galvanized-Metal Substrates: (Includes galvanized steel railings, exterior face of hollow metal doors, and other metal surfaces):

1. Pigmented Polyurethane System:

a. Intermediate Coat: Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6)

1) Sherwin-Williams Protective & Marine, Acrolon 100 Polyurethane Gloss, light grey.

b. Top Coat: Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6)

1) Sherwin-Williams Protective & Marine, Acrolon 100 Polyurethane Gloss, color to match Design Team’s sample.

B. Structural and Ornamental Metal (Exterior Exposed Structural Steel and miscellaneous steel, exterior steel railings, guardrails, railings including handrails, railing infill and balusters):

Surface Prep: Commercial Blast Cleaning SSPC-SP3
Intermediate: Macropoxy 646 Fast Cure Epoxy (5.0 – 10.0 DFT)
Finish Coats (2 coats): Acrolon 100 Polyurethane Gloss (3.0 – 6.0 DFT)

C. Comparable coating systems of the other named manufacturers are acceptable.

3.07 COLOR SCHEDULE

A. Colors selected by Architect from full range of industry colors.

END OF SECTION

SECTION 09 97 23

CONCRETE SEALER

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes colorless sealer compound for new and existing exposed interior concrete slabs with steel trowel finishes as scheduled on drawings. Coordinate with Section 03 30 00 – Cast-in-Place Concrete and the following:

B. Related Sections/Drawings:

1. Schedule of Finishes on the drawings.

1.02 ACTION SUBMITTALS

A. Prepare submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's specifications and application instructions for each product. Include data substantiating that materials are recommended by manufacturer for applications indicated. Include the following information for installation instructions:

1. Environmental conditions, including temperature, relative humidity, wind conditions and sun exposure under which materials may be applied.
2. Methods and equipment which will be used in application of curing and sealer.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

B. Applicator's Qualifications: Engage an experienced Applicator who employs only persons trained and approved by curing and sealer manufacturer for application of products and issuance of special warranty.

C. Manufacturer Qualifications: Provide products produced by a company that has successfully specialized in production of this type of work for not less than 5 years.

D. Field Sample: Prior to installation of work of this Section, apply coating sample at location directed by or acceptable to the Architect, using specified materials and illustrating finish and workmanship to be expected in the completed work. Retain mockup that has been approved by the Architect until the work has been completed and accepted.

1. Configuration: Approximately 4 feet by 4 feet.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Comply with requirements specified in Section 01 60 00 – Product Requirements.

B. Deliver materials to site in sealed, original, labeled containers bearing manufacturer's name, type of material, brand name, and instructions for mixing. Store materials off-ground, and under cover. Conform to any additional recommendations of the manufacturer regarding storage and handling of the materials.

C. Architect reserves the right to inspect the containers prior to their opening, to review accompanying bills of lading, and to reject materials in opened containers.

1.05 PROJECT CONDITIONS

A. Environmental Requirements: Do not proceed with installation until areas to receive the work have been enclosed and until temperature and relative humidity have been stabilized and will be maintained within values established by the manufacturer for optimum quality control.

1.06 WARRANTY

A. General: Refer to Division 01 for additional requirements.

B. Dustproofer and Sealer Warranty: Furnish manufacturer's single source labor and materials warranty, signed by an officer of the manufacturing company, for a period of ten (10) years for concrete surfaces. Warranties shall start on date of Substantial Completion. Include in warranty the following:

1. Failure of the dustproofer and sealer to retain its dustproofer capability caused by defective material, from application or from the ordinary wear and tear.
2. Failure of dustproofer and sealer to prevent damage to concrete evident within the warranty period.
3. Warranty shall not be limited to the original cost of materials and labor.
4. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 – PRODUCTS

2.01 CONCRETE SEALER

A. Water Based Acrylic Sealing Compounds:

1. ASTM C1315, Type I, Class A, VOC compliant, free of natural or petroleum waxes. Dries clear with satin sheen.
2. VOC Requirement: Less than 100 g/L
3. Acceptable Products:

a. Diamond Clear, Euclid Chemical Co., Cleveland, OH
b. Lumiseal WB Plus, L&M Construction Chemicals, Inc., Omaha, NE.
c. VOCOMP-30, WR Meadows, Inc., Hampshire, IL.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions affecting performance and conditions of floor treatment with requirements for maximum moisture content. Verify concrete slabs are flat, level, and dry.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter for concrete: 12 percent.
2. Verify compatibility with and suitability of substrates, including existing finishes or primers. Verify if plasticizers, if any, in existing concrete substrate will not impair bond.
3. Commence application after unsatisfactory conditions are corrected and surfaces are dry.
4. Commencement of floor treatment application indicates acceptance of surfaces and conditions.
5. Perform tests recommended by manufacturer. Proceed with installation after substrates pass testing.

3.02 PREPARATION

A. Clean substrate, removing projections and substances detrimental to the work; comply with recommendations of manufacturer for preparation procedures. Mask off or protect adjacent surfaces not scheduled to receive sealer.

B. Concrete Substrates: Prepare and clean substrates according to manufacturer's written instructions.

1. Clean substrates of substances that impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants. Neutralize plasticizers that cannot be removed.
2. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
3. Remove incompatible primers and reprime substrate with compatible primers as required
4. Remove laitance, glaze, curing compounds, form release agents, dust, dirt, grease, Oil, and contaminants that impair bond. Remove contaminants using mechanical Means.

5. Treat nonmoving substrate cracks and control joints to prevent cracks from telegraphing (reflecting) through flooring according to manufacturer's written recommendations.
6. Protect substrate voids and joints to prevent flooring resins from flowing into or leaking through them.
7. Protect walls, floor openings, equipment inserts, electrical openings, door frames, and Obstructions during installation. Cover floor and wall areas at mixing stations.

3.03 APPLICATION

A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Concrete Sealer: Spray apply sealer system components according to manufacturer's written instructions.

3.04 PROTECTION

A. Institute protective procedures and install protective materials as required to ensure that work is without damage or deterioration at Substantial Completion. Protect adjacent work against damage from concrete flooring treatment. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities and before Substantial Completion, touch up and restore damaged or defaced treated surfaces.

END OF SECTION

SECTION 10 14 00

INTERIOR SIGNAGE

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes interior signs and attachment material including the following.

1. Interior signage required by code, including but not limited to room names, emergency egress maps, fire related signs, stairs, restrooms and occupancy.
2. Directional.
3. Room name and number signs.

B. Related Documents:

1. Signage schedule and details on the drawings.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals per requirements of Section 01 33 00 – Submittal Procedures.

B. Submit sign schedule to Architect for final approval prior to fabrication.

C. Submit shop drawing listing sign styles, lettering and locations, mounting methods, and overall dimensions of each sign. Drawings for individual letters should indicate proposed spacing. Locations shall be reviewed with the Architect in the field.

D. Submit available colors for all products.

E. Submit manufacturer's installation instructions for each sign type and material. Include installation template and hardware.

1.03 QUALITY ASSURANCE

A. ADA compliant containing tactile symbols, raised lettering and Grade 2 braille.

B. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products in protected location prior to installation.

B. Package signs, labeled in name groups.

C. Products shall remain in manufacturer's protective wrappings and shall bear identification of manufacturer.

D. Store adhesive tape at ambient room temperatures.

PART 2 – PRODUCTS

2.01 INTERIOR SIGNAGE MATERIAL

A. Acrylic Signs Material: Acrylic face, 1/16-inch thick with 1/32-inch raised text, pictograms and clear set Braille.

1. All exposed edges on acrylic signs shall be sanded smooth.
2. Raised characters and graphics shall be painted in contrasting color.
3. Colors as indicated.

B. Font: MoolBoran, upper case or all capital letters with letter heights as indicated on architectural drawings. Text as indicated in the signage schedule.

C. Braille: Grade II Braille will be used.

1. Braille cells should be dome topped for ease of readability and be the same color as the background.
2. Sign manufacturer is responsible for assuring accuracy of spelling.
3. For copy Braille is centered horizontally directly below the word.

D. Mounting Accessories: Provide as required and recommended by signage manufacturer for a complete installation. Install signs at dimensions indicated on drawings.

E. Adhesives and Fasteners: Type recommended by the signage manufacturer to meet specified general and structural support criteria. Exact identification of adhesives and fasteners shall be noted on shop drawings, including data describing method of application.

2.02 INTERIOR IDENTIFICATION SIGNAGE

A. Refer to signage illustrations on the drawings.

PART 3 – EXECUTION

3.01 SIGNAGE INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after doors and walls are finished, in locations indicated. Where locations are to be determined in the field, the Contractor shall consult with the Architect prior to beginning installation.

C. Refer to schedule and drawing for mounting locations. Unless otherwise noted, signs will occur outside of the room listed.

1. Verify all locations and heights with the Architect.
2. Clean and polish signage, and protect units from damage.

3.02 SIGN SCHEDULE

A. This preliminary sign schedule shall be reviewed and approved by the Owner prior to fabrication. Refer to drawings for location by Sign Tag.

END OF SECTION

SECTION 10 21 13

TOILET COMPARTMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes phenolic-core toilet compartments configured as toilet enclosures and including the following:

1. Floor anchored/overhead braced partitions.
2. Operating hardware and attachment hardware.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry: Blocking.
2. Section 09 29 00 – Gypsum Board
3. Section 09 30 00 – Tiling
4. Section 10 28 13 – Toilet Accessories: for accessories mounted to toilet partitions.
5. Schedule of Finishes and Legend on the drawings.

1.02 REFERENCES

A. American National Standards (ANSI): ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

B. National Electrical Manufacturer's Association (NE MA): NEMA LD3 - High Pressure Decorative Laminate

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product data: Manufacturer's catalog cuts of typical panel, pilaster, door, hardware, accessory and fastening.

C. Submit shop drawings indicating partition plan and elevation views, dimensions, details of wall and floor supports, door swings, and instructions for installation of anchorage devices built into other work.

1. Show ceiling grid and overhead support or bracing locations.

D. Sample Warranty: Meet or exceed provisions specified by this Section. Include manufacturer's exclusions and limitations.

1.04 REFERENCES

A. ICC A117.1 – Accessible and Usable Buildings and Facilities.

1.05 QUALITY ASSURANCE

A. Components of toilet partitions shall be sourced from one single source manufacturer who certifies that materials meet or exceed specifications.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25-75.
2. Smoke-Developed Index: 450 or less.

1.06 PROJECT CONDITIONS

A. Take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

B. Verify that adequate blocking exists. If necessary, furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

C. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in the manufacturers original containers with labels indicating brand names, colors and quality designations, legible and intact.

B. All doors, panels and pilasters shall arrive at the job site with factory applied protective masking.

C. Store and protect accepted materials in accordance with the manufacturer's direction and recommendations.

1.08 WARRANTY

A. Manufacturer: Minimum 15 year Warranty against defects in materials and workmanship, including warping and delamination of partition panels.

B. Manufacturer shall provide a 5-year warranty for all chrome hardware, and a lifetime warranty for stainless steel hardware.

PART 2 – PRODUCTS

2.01 MANUFACTURER – PHENOLIC-CORE UNITS

A. Manufacturer:

1. Basis-of-Design: Specifications are based on overhead-braced, ASI Global products "Color-Thru" toilet partition system.

B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required:

1. General Partitions
2. Scranton Products.
3. Bradley.
4. Metpar.

C. Toilet-Compartment Style: Floor-mounted, overhead braced.

2.02 PANEL COMPONENTS

A. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch-thick doors, minimum ¾ inch thick pilasters and minimum 1/2-inch-thick panels.

1. Resistant to delamination, water, steam, corrosion, soaps, detergents, and mildew.
2. Edges: Black solid phenolic resin, radiused and polished.
3. Fire hazard: Class B in accordance with ASTM E84 with 35 maximum flame spread and 100 maximum smoke development.

B. Pilaster Shoes: Fabricated from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

C. Headrail (Overhead Brace): Heavy duty construction, extruded aluminum, anti-grip profile, approximately 1/8 inch thick, clear anodized finish.

D. Mounting Bracket Panel Fasteners:

1. Face Panels: Factory installed stainless steel or brass threaded inserts and machine screws with one-way security heads, except for concealed fasteners.

2. Side Panels: Through-bolted stainless steel, one-way threaded bolts and barrel nuts.

E. Hardware Fasteners: Standard screws with threaded inserts or through-bolted stainless steel, one-way threaded bolts and barrel nuts.

F. Furnish hardware to be built into other construction, such as inserts, anchors, and tie rods in timely manner to prevent delay.

2.03 COMPARTMENT HARDWARE

A. Hardware: Heavy-duty institutional quality hardware and fasteners necessary to complete the installation shall be provided.

1. Brackets: Continuous heavy duty anodized extruded aluminum (6063-T5 alloy) wall brackets, mounted with stainless steel screws.
2. Hinges: Continuous piano hinge, stainless steel. The closing position of each hinge shall be fully adjustable.

B. Outswing Doors: Spring loaded, self-closing.

C. Fasteners: Standard bolts, predrilled holes, brass inserts maximum 8 inch centers.

D. Sliding Door Latch:

1. Slider: Minimum 14 gauge Type 304 stainless steel or heavy cast stainless steel on nylon track.
2. Keeper: Minimum 8 gauge Type 304 stainless steel, one piece design.
3. Door Bumper: Rubber, located on latch.

E. Door Stops: Two 11 gauge stainless steel or heavy duty cast stainless steel, vinyl coated.

F. Clothes Hook: Specified for type and quality. Stainless steel cast or welded fabrication with rubber tipped bumper. One per stall.

G. Other Partition Mounted Toilet Accessories: Specified Section 10 28 13 and “Toilet and Layout, Accessories on drawings.

2.04 FABRICATION

A. Conform to following and ICC/ANSI A117.1for ambulatory accessible and wheelchair accessible compartments.

B. Toilet Compartment Dimensions:

1. Bottom of Panel: 12 inch above floor.
2. Top of Panel: 70 to 72 inch above floor.
3. Compartment Width: As shown on Drawings, except no less than 34 inches on center.

C. Toilet Compartment Doors: Minimum 24 inch wide, swing-in, except minimum 36 inch wide swing out doors at accessible compartments. Doors to stand slightly open when not in use.

D. Stabilizer Bars: 3 inch wide by 1 inch phenolic panel lateral bracing between compartments, mounted continuously across front of toilet compartments and fastened into pilasters

E. Pilasters: Cover floor mounted anchoring devices with pilaster shoe. Make maximum width to suit installation clearances. 8 to 12 inches preferred.

2.05 FINISHES

A. Refer to Interior Finish Schedule on the drawings.

B. Partition edge: Black or brown phenolic core, polished smooth, eased.

C. Stainless Steel: No. 4 Satin finish.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Verify spacing of plumbing fixtures and drains.

C. Verify correct location of built-in framing, anchorage, and bracing, where required.

D. Beginning of installation means acceptance of existing surfaces.

3.02 INSTALLATION

A. Install partitions and screens secure, plumb, and level and in accordance with manufacturer's instructions. Secure stiles to supporting structure.

B. Maintain 3/8-inch to 1/2-inch space between wall and panels and not more than 1 inch between wall and end pilasters.

C. Pilasters shall be rigidly fastened to floor and with pilaster leveling nuts. Attach panel brackets securely to walls using anchor devices. Verify location of blocking within metal framed walls to assure positive anchorage of anchors into blocking.

D. Attach panels and pilasters to bracket with through sleeve tamperproof bolts and nuts.

E. Equip each door with two hinges, one door latch, and bumper.

F. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.

G. Adjust hinges to locate doors in partial opening position when unlatched. Return outswing doors to close position.

H. No evidence of drilling, cutting or patching shall be visible in the finished work.

3.03 ADJUSTING/CLEANING

A. Adjust, lubricate, and align hardware to uniform clearance at vertical edge of doors, not exceeding 1/4-inch.

B. Remove protective maskings. Clean surfaces.

C. Replace damaged or scratched materials with new materials.

D. Protect installation during remainder of construction.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes toilet and bath accessories.

1. Furnish toilet and bath accessory templates, to locate anchorage reinforcement, to trades responsible.

B. Related Sections:

1. Section 06 10 00 – Rough Carpentry: Wood blocking for support of toilet and bath accessory items.
2. Section 09 29 00 – Gypsum Board: For required wood or metal supports within metal stud wall system.
3. Section 09 30 13 – Ceramic Tiling.
4. Refer to Drawings for toilet accessory schedule and accessory mounting heights.

1.02 REFERENCES

A. ADAAG: Americans with Disabilities Act Accessibility Guidelines.

B. ANSI A117.1 – Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.

C. Ohio Building Code – Chapter 11 – Accessibility.

1.03 SYSTEM DESCRIPTION

A. Toilet accessories shall be provided to conform with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and State and Local Regulations. These requirements supersede Technical Specifications in this Section.

1. Product data on accessories indicating quality, describing size, finish, details of function, attachment methods.
2. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
3. Setting drawings, templates, instructions, and directions for installation of anchorage devices and cut-out requirements in other work.
4. Maintenance instructions including replaceable parts and service recommendations.

1.04 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:

1. Plans: Locate each specified unit in project.
2. Elevations: Indicate mounting height of each product.
3. Details: Indicate anchoring and fastening details, required locations and types of anchors and reinforcement, and materials required for installation of specified products.

C. Verification Samples: One sample chips of each specified color and finish.

1.05 INFORMATIONAL SUBMITTALS

A. Literature: Manufacturer's product data sheets, for each item furnished hereunder.

B. Schedule: Complete schedule, indicating types, quantity, and model numbers of accessories for each location in which the accessories will be installed.

C. Selection samples: Sample color chips indicating each manufacturer's full range of colors available for selection by Architect.

D. Verification samples: Complete units, as requested by Architect.

E. Manufacturer's Warranty:

1. Deliver to the Owner upon completion of the work of this Section, applicable manufacturer's standard warranties.

F. Closeout Submittals: Warranty, issued and executed by manufacturer, and countersigned by Contractor.

1. One set of special adjusting or installation tools unique to the products furnished under this section.
2. Keys to accessories furnished under this section.

1.06 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 3, provide products of same manufacturer unless otherwise scheduled or approved by Architect.

B. Furnish accessory manufacturer's inserts and anchoring devices for use in masonry or concrete; coordinate delivery with other work to avoid delay.

C. Design, fabricate, and install handicapped toilet compartment grab bars capable of withstanding a downward dead load of at least 250 lb. per foot without damage or permanent set to grab bar members or anchors.

D. Exercise care to prevent damage to existing surfaces or equipment. At time of completion, accessories shall be in perfect condition, well anchored, and in proper alignment at the location indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver accessories in manufacturer's original containers and store in same until installation.

B. Keys: Furnish 2 keys for each accessory item required to have a lock. Seal in clearly marked envelopes and turn over to Owner prior to building acceptance.

1.08 PROJECT CONDITIONS

A. Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.09 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Coordinate locations, dimensions, and other pertinent details with installation of backing, blocking, and electrical connections.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Toilet accessories shall be manufactured by Bobrick Washroom Equipment, Inc., Clifton Park, NY; specified as the type, size and function as described in the Toilet Accessory Schedule.

B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, function, and arrangement required:

1. Bradley Corporation, Menomonee Falls, WI
2. American Specialties Inc., Yonkers, NY

2.02 MATERIALS: TOILET ACCESSORIES

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

1. Provide tempered glass, where indicated.

H. Galvanized Steel Mounting Devices: ASTM A153, hot dip galvanized after fabrication.

I. Fasteners and Anchors: Non-corrosive, theft-resistant, screws, bolts and other fastening devices of same material as accessory unit or of galvanized steel where concealed.

1. Provide mounting kits with stainless steel screws for accessories requiring same.
2. Mounting kits shall include toggle nuts for hollow walls and expansion shields for solid walls. Provide 2 fasteners at each mounting plate.
3. Provide 12 gauge, 3 inches wide, steel concealed anchor plates with tapped holes for installation of grab bars on walls constructed with metal studs.
4. Provide concealed anchors for installation of grab bars on solid walls. Anchor assembly shall consist of tapped 12 gauge anchor plate, 10 gauge back plate, and 3/8 inch diameter thru-wall bolt.

J. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing and resupply.

2.03 INSTALLATION OF ACCESSORIES

A. Fasteners, screws, and bolts: Type 304 stainless, tamperproof.

B. Expansion shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.

2.04 FABRICATION

A. Recessed and modified surface mounted dispensing and disposal cabinets shall be constructed as follows:

1. Exposed surfaces shall be of 22 gauge type 304 stainless steel with concealed stainless steel piano hinge on doors.
2. There shall be 1/4 inch return on face trim.
3. Each cabinet shall be provided with pin tumbler type locks (to match existing if possible) and two keys with the exception of the napkin vendors, which shall have door locks and coin box locks, keyed differently.
4. Cabinets shall have a common fascia with grain on exposed surfaces, lapped in one direction to a #4 satin finish.
5. Dispensers shall be equipped with sight or mechanical gauge for easier refill.
6. Disposals shall be completely enclosed and removable plastic; waste receptacles shall be constructed of heavy duty polyvinyl.

B. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

C. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft-proof installation, as follows:

1. One piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

D. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of 6 keys to Owner's representative.

2.05 FACTORY FINISHING

A. Ferrous metals: Clean and treat, spray apply one coat of baked-on rust and moisture-resistant primer, followed by two coats of baked-on synthetic enamel, in selected colors. Ensure that finish coating is uniform in color intensity and degree of gloss, throughout.

B. Chrome/Nickel Plating: ASTM 456, Type SC2, satin finish.

C. Stainless steel: Number 4 satin finish, except as otherwise specified above under the Article entitled “Toilet Accessories”.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Install accessories in accurate locations as noted on drawings; securely anchored to substrate surfaces.

B. Install items in accordance with manufacturer's recommendation.

1. Wall mounted items to be secured with devices suitable for the wall construction. Lead, plastic, wood, or fiber plugs are not acceptable.
2. Accessories not located on drawings shall be installed where directed by the Architect.
3. Provide theft resistant type exposed fasteners.

C. Install accessories plumb, level, straight, and properly aligned with adjacent surfaces.

1. Install accessory units to accommodate the physically handicapped, with operating areas of coin slots, openings for dispensers and waste not more than 40 inches above the floor.
2. Mount grab bars at not greater than 36 inches above the floor, and anchor to comply with specified performance requirements. Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
3. Comply with ANSI A117.1 accessibility requirements.

D. Accessories shall have concealed mounting and fastening devices for types of partitions as follows:

1. Concrete masonry units: Integral anchors.
2. Gypsum board and metal stud partitions: Screws or bolts secured to metal plates anchored to studs.

E. Coordinate installation of accessories in toilet compartments and work of other trades to allow proper operation. Notify the Architect in case of conflict.

3.04 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes portable fire extinguishers and fire-protection cabinets.

B. Related Section:

1. Section 04 20 00 – Unit Masonry
2. Section 09 29 00 – Gypsum Board

1.02 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers

B. ADA Accessibility Guidelines

C. UBC Standard 7-5 (ASTM E-814-83) - Fire-rated cabinet option for combustible and non-combustible walls.

1.03 ACTION SUBMITTALS

A. Prepare the following submittals in accordance with Section 01 33 00 – Submittal Procedures:

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain extinguishers through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, “Standard for Portable Fire Extinguishers.”

C. Each extinguisher shall be listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Equipment shall conform to all applicable codes and regulations in effect at the project location.

1.05 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit manufacturer's operation and maintenance data including test, refill or recharge schedules, procedures, and re-certification requirements.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Fire-Protection Cabinets:

a. Larsen's Manufacturing Company
b. J.L. Industries, Inc.
c. Potter-Roemer; Div. of Smith Industries, Inc.

2. Portable Fire Extinguishers:

a. Amerex Corporation.
b. Ansul Incorporated.
c. Badger; Div. of Figgie Fire Protection Systems.
d. J.L. Industries, Inc.
e. Kidde: Walter Kidde, The Fire Extinguisher Co.
f. Larsen's Manufacturing Company.
g. Potter-Roemer; Div. of Smith Industries, Inc.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.
2. Extruded Shapes: ASTM B 221.

2.03 FIRE PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

1. Basis of Design: Larsen’s Architectural Series, Model 2409-R2 (recessed).

a. Fire-rated version: FS 2409-R2

2. Basis of Design: Larsen’s Architectural Series, Model 2409-6R (semi-recessed).

a. Fire-rated version: FS 2409-6R

B. Cabinet Size:

1. Suitable for fire extinguisher specified but minimum 24 inches H, 9-1/2 inches W, and 6 inches D inside box dimensions.

C. Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E814 for fire-resistance rating of wall where it is installed. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch (1.2-mm) thick, cold-rolled steel sheet lined with minimum 5/8-inch thick, fire-barrier material. Provide factory drilled mounting holes.

1. Cabinet Metal: Enameled-steel sheet.
2. Shelf: Same metal and finish as cabinet.

D. Cabinet Mounting: Suitable for the following:

1. Recessed: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

a. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

2. Semi recessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated. Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi recessed cabinet installation.

a. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

3. Surface Mounted: : Cabinet box fully exposed and mounted directly on wall with no trim. Provide where walls are of insufficient depth for semi recessed cabinet installation.

E. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

1. Trim Material: Sheet steel.

F. Door Style and Material: Manufacturer's standard, as follows:

1. Door Material: Sheet steel.
2. Door Style: Solid opaque panel with frame
3. Door Construction: Provide a minimum ½-inch thick door frames.

G. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed door pull handle and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

1. Door hardware shall comply with ADA requirements for wall projection.

H. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the exterior and interior of the cabinet and doors.

2.04 FIRE EXTINGUISHERS

A. Basis of Design: Multi-Purpose Dry Chemical Type UL rated 4-A:80-B:C; 10 pounds nominal capacity; in red enameled steel container; for Class A, Class B, and Class C fires.

B. Basis of Design (Designated for Food Service Areas): Wet-chemical Class K Type Extinguisher, UL rated 2-A:K; 6 liter nominal capacity; in steel container; for Class K fires.

C. Provide one fully charged fire extinguisher for each fire extinguisher cabinet.

D. Safety Release Handle: Design to prevent accidental discharge

E. Meter: Design to indicate level of charge.

F. Metal Plate: Embossed with description of performance, indicating code and UL conformance.

G. Furnish manufacturer's standard surface brackets for the surface mounted extinguishers.

H. Fire extinguishers shall be furnished complete with charge services and ready for operation.

2.05 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

a. Location: Applied to cabinet door

1) Larsen's "Type A".

b. Application Process: Silk-screened
c. Lettering: Black, 2-inch lettering
d. Orientation: Vertical

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed. Verify that rough openings for cabinets are correctly sized and located.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

3.02 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION OF FIRE EXTINGUISHER CABINETS

A. Comply with manufacturer's written instructions for installing fire extinguisher cabinets.

B. Install fire extinguisher cabinets at locations specified on the drawings.

C. Mounting Height: Install fire extinguisher cabinets at the height required so that the top of the fire extinguisher is not more than 54 inches above the floor.

D. Fire extinguisher cabinets shall protrude no more than 4 inches into corridors, passageways, or aisles.

E. Repair/paint wall surfaces surrounding fire extinguisher cabinet damaged during installation to match existing wall surface.

3.04 INSTALLATION OF FIRE EXTINGUISHERS

A. Install portable fire extinguishers on the hanger or in the bracket supplied. Verify that the extinguisher operating instructions face outward.

B. Comply with manufacturer's written instructions for installing fire extinguishers and mounting brackets.

C. Mounting Height: Install portable extinguishers at height indicated below.

1. Install fire extinguishers mounted on hangers or brackets attached to a wall so that the top of the fire extinguisher is not more than 3½ ft. above the floor.

3.05 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors to swing and operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 11 40 00

FOOD SERVICE EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes stainless-steel tables, countertops and sinks.

B. NOTE: FOOD SERVICE EQUIPMENT IS OWNER-FURNISHED AND CONTRACTOR INSTALLED.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.04 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Regency

2.02 PERFORMANCE REQUIREMENTS

A. System Structural Performance: Metal countertops and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Support Framing System: 600 lb/ft.
2. Work Surfaces: 200 lb/ft.
3. Shelves: 40 lb/sq. ft.

2.03 MATERIALS

A. Submit a certified copy of the mill analysis of materials if requested by the Architect.

B. Stainless steel sheets shall conform to American Society for Testing and Materials (ASTM) specification A240, Type 304 Condition A, 18-8, having a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view. Sheets shall be uniform throughout in color, finish, and appearance.

C. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.

D. Rolled shapes shall be of the cold-rolled type conforming to ASTM A36.

E. Galvanized sheet steel shall conform to ASTM A526; where extensive forming to take place, conform to ASTM A527; conform to ASTM A525, coating designation G115, chemical treatment.

F. Galvanized steel sheets shall be cold-rolled, stretcher leveled, bonderized, and rerolled to ensure a smooth surface.

G. Sound Dampening: NSF-certified, nonabsorbant, hard-drying, sound deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8" (3 mm) thickness that does not chop, flake, or blister.

H. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 07 92 00 – Joint Sealants.

1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone .
2. Color: Clear.
3. Sealant shall have a VOC content of 250 g/L or less.

2.04 STAINLESS-STEEL TABLES, COUNTERTOPS AND SINKS

A. Tables: Welded tubing legs, not less than 2 inches square with channel stretchers as needed to comply with product standard. Weld or bolt stretchers to legs and cross-stretchers, and bolt legs to table aprons. Provide leveling device welded to bottom of each leg.

1. Leg Shoes: Satin-finished, stainless-steel, open-bottom, slip-on type.

B. Countertops: Fabricate from 0.062-inch- thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch over the base cabinets.

1. Joints: Fabricate tables and countertops without field-made joints.
2. Weld shop-made joints.
3. Sound deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1-inch- thick edge with a 1/2-inch return flange.
5. Form the backsplash coved to and integral with top surface, with a 1/2-inch-thick top edge and 1/2-inch return flange.
6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
7. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.

C. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050-inchnominal thickness. Fabricate with corners rounded and coved to at least 5/8-inchradius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.

1. Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch diameter.
3. Factory punch holes for fittings.
4. Provide sinks with stainless-steel strainers and tailpieces.
5. Provide sinks with integral rims except where located in stainless-steel countertops.
6. Apply 1/8-inch- thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.05 STAINLESS-STEEL FINISH

A. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be finished to match adjacent undisturbed surfaces.

B. Galvanized shelving shall not be painted.

C. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches o.c.

3.03 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

3.04 FOOD SERVICE EQUIPMENT SCHEDULE

A. Refer to schedule on the drawings.

END OF SECTION

SECTION 12 36 13

PRECAST CONCRETE COUNTERTOPS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes shop precast concrete countertops including reinforcement, concrete materials, mixture design, placement procedures, and finishes and surface treatments:

1. Templating, fabrication and installation of precast concrete countertops.

1.02 ACTION SUBMITTALS

A. Prepare the following submittals under provisions of Section 01 33 00:

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Cleaning and maintenance instructions.

C. Shop Drawings: Detail fabrication and installation of concrete countertop units. Indicate locations, plans, elevations, dimensions, shapes, cross sections of each unit, and attachments to other Work. Show sections and details either full size or at 3" = 1' - 0" scale.

1. Show locations and sizes of furring, blocking, and support strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for grommets, plumbing fixtures and fittings, and proposed joint locations.
3. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, indicate proposed modifications on Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples for Initial Selection: For integrally-colored colored concrete, showing manufacturer's actual cured samples consisting of units or sections of units showing the full range of colors available.

1. If variation in color or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.

E. Samples for Verification: For each concrete color and finish selected, in sets of Samples not less than 12 inches square. Include two or more Samples in each set and show the full range of variations in appearance characteristics expected in completed Work.

F. Design Mixtures: For each concrete mixture.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners.

B. Maintenance Data: For concrete countertops to include in maintenance manuals. Include Product Data for countertop-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to ANSI A117.1 or local code if more stringent requirements are applicable for installing work for accessibility to handicapped.

B. Manufacturer Qualifications: Company specializing in fabricating work specified in this Section with minimum five years' experience in type work required for Project.

C. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate concrete countertops similar to that indicated for this Project and whose products have a record of successful in-service performance for not less than five years.

D. Installer Qualifications: Fabricator of concrete countertops.

E. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer. Obtain concrete primers and sealers through one source from a single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store and handle concrete and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move, if required, using dollies with cushioned wood supports.
2. Store on wood A-frames or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to concrete. Ventilate under covers to prevent condensation.

B. Handle, transport and store units to prevent damage to materials or structure. Handle with care to prevent damage to corners and edges.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive concrete countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Templating:

1. Cabinets, millwork or other supporting structures must be fully installed prior to templating, unless otherwise arranged with manufacturer.
2. Cabinets, millwork or other supporting structures must be free of debris or obstructions.
3. Fixtures that penetrate the concrete, such as sinks, faucets, drop-in cook tops, soap dispensers, etc., must be on site at the time of templating.

C. Maintain ambient and surface temperatures above 40 degrees F (4 degrees C) during application and drying period, minimum 24 hours after application of concrete countertops.

D. Provide supplementary heat for installation in temperatures less than 40 degrees F (4 degrees C).

E. Provide protection for countertop surfaces until inspection is complete.

1.07 COORDINATION/SCHEDULING

A. Sequence work to provide protection of construction materials from weather deterioration and proper sequencing for installation.

B. Coordinate installation with specific trades including substrate and or cabinet contractors. Coordinate with trades attaching surface-mounted objects on countertops.

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard written limited materials warranty, one year.

B. Contractor's Warranty: Provide Contractor's standard written labor warranty, two years.

1.09 MAINTENANCE

A. Maintenance Data: For concrete countertops to include in maintenance manuals. Include product data for concrete-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design manufacturer:

1. Concrete Designs, Overland Park, KS

2.02 CONCRETE COUNTERTOPS

A. Subject to compliance with requirements, provide manufacturer's standard, lightweight, reinforced concrete products:

1. Color and Texture: As selected by Architect from manufacture's full range.
2. Finish: Polished.

B. Precast Concrete Countertop:

1. Structurally engineered and custom made using a precast, custom-blended, structurally reinforced Portland cement based concrete.
2. Density: approx. 140 lbs. per cubic foot. Weight per unit area: 14lbs/sq. ft. for 1.75" thick slabs.
3. Standard Thickness: 1.75" nominal. Options: Custom thickness and front edge returns. Minimum thickness for horizontal slabs is 1.5".
4. Standard Edge: Square edge, eased radius and corners.
5. Color: As selected from manufacturers standard color palate.
6. Standard Maximum Seamless Casting: approximately 8 ft. L for standard depth countertops (25"). Options: Custom sizes and shapes as specified in shop drawings.
7. Backsplashes: Length matched to slab section. Max 96" L x specified height. Height, length and thickness will affect maximum length. Backsplashes are cast separate from the countertops.
8. Sealer: All units to be factory sealed with a high performance topical sealer. This sealer must exhibit the following properties:

    a. Safe for food contact surfaces.
    b. Colorless.
    c. Suitable for interior use
    d. Water repellent
    e. Non-yellowing (UV resistant).
    f. Scratch resistant.
    g. Peel, chip and flake resistant
    h. Highly heat resistant.
    i. Stain resistant to food and oil when wiped up immediately.
    j. Long lasting.
    k. Environmentally safe.
    l. Simple and quick reapplication only when necessary.

9. Cracks: Non-structural hairline cracks are possible and may result from shrinkage or substrate movement over time. These are not covered under standard warranty.

2.03 ADHESIVES, SEALANTS, AND CONCRETE ACCESSORIES

A. General: Use only adhesives formulated for concrete that are recommended by their manufacturer for the application indicated.

B. Concrete Adhesive: Epoxy adhesive, formulated specifically for bonding concrete to concrete, or other substrates, with an initial set time of not more than two hours at 70 deg F.

C. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 07 92 00 – Joint Sealants and that will not stain the concrete it is applied to.

D. Concrete Cleaner: Specifically formulated for concrete types, finishes, and applications indicated, as recommended by concrete producer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

E. Concrete Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of concrete surfaces, as recommended by concrete producer for application indicated.

2.04 FABRICATION

A. Fabricate concrete countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.

1. Units to be custom made in manufacturer's manufacturing shop.

B. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces.

C. Joints: Fabricate countertops without joints.

D. Blockouts and Holes:

1. Undercounter Fixtures: Form blockouts for fixtures and fittings using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

E. Units are structurally reinforced to accommodate appropriate spans, cutouts and cantilevers. Slabs must be handled and moved while in a vertical orientation, similar to the technique used for handling plate glass.

F. Fabricate units straight, smooth, and true to size and shape prior to finishing. Finish exposed edges per edge specifications. Maximum dimensional variations: +0", - 1/4" at maximum slab length; typical variations are usually half of the maximum or less.

G. Fabricate to accommodate specified appliances (i.e. sinks, cook tops, faucets, etc.). Verify sink number with drawings.

2.05 FINISH

A. Hand finish units prior to sealing. Hand finishing includes first grinding the surface, then filling voids and honeycomb with colored grout, easing all edges (where appropriate), and leveling and polishing.

B. Units to be air dried and sealed.

PART 3 – EXECUTION

3.01 SUBSTRATE INSPECTION

A. Check dimensions of substrate surfaces, including but not limited to length, width, height, radiuses, and angles, that supporting surface, as built, will accept the countertop as fabricated.

B. Report deviations from the requirements of project specifications or other conditions that might adversely affect the countertop installation to the Architect. Do not start work until deviations are corrected.

C. Level surfaces to comply with required tolerances in this specification.

D. Installation Tolerances:

1. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches .
2. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.
3. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.
4. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.

3.02 TEMPLATING

A. Manufacturer performs templating, or, manufacturer provides detailed templating instructions to contractor, and contractor provides templates to manufacturer.

3.03 CONCRETE SEALING

A. Surface Preparation: Clean and prepare surfaces according to manufacturer's written instructions for each particular substrate condition and as specified.

B. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not stain surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions

1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry.

C. Clear Sealer:

1. General: Apply sealer at manufacturer's recommended spreading rate to ensure proper penetration. Use applicators and techniques best suited for substrate and type of sealer material being applied
2. Integrally-Colored Concrete: Apply two coats of clear penetrating sealer to properly cured concrete surfaces.

3.04 INSTALLATION

A. Set concrete countertops to comply with requirements indicated. Shim and adjust concrete to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure concrete countertops in place.

B. Provide installation method recommended by manufacturer or fabricator:

C. Install backsplashes and end splashes by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splashes for filling with sealant. Use temporary shims to ensure uniform spacing.

D. Apply sealant to joints and gaps; comply with Section 07 92 00 – Joint Sealants." Remove temporary shims before applying sealant.

3.05 ADJUSTING AND CLEANING

A. General:

1. Keep installed work clean as work progresses.
2. Wipe up spills as soon as possible. Clean using damp cloth or sponge and mild, non-surfactant, neutral pH detergent or other water-based cleansers. Do not use harsh chemicals, abrasive cleansers or abrasive scrubbers. Manufacturer recommended cleanser.

B. Remove and replace concrete countertops of the following description:

1. Broken, chipped, stained, or otherwise damaged concrete. Concrete may be repaired if methods and results are approved by Architect.
2. Defective countertops.
3. Defective joints, including misaligned joints.
4. Concrete countertops and joints not matching approved Samples and mockups.
5. Concrete countertops not complying with other requirements indicated.

C. Replace in a manner that results in concrete countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Clean concrete countertops not less than six days after completion of sealer application, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage concrete.

END OF SECTION

SECTION 20 05 01
INTRODUCTORY STATEMENT

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of Instructions to Bidders, General Conditions, and Division 1 apply to all work herein.

B. In addition to conforming to the documents listed in Paragraph A above, the work performed by the Plumbing, Fire Protection, and Heating, Ventilating and Air Conditioning (HVAC) Contractors shall conform to all provisions of Sections 20 00 00 through 20 99 99 as included in this Specification. The Plumbing, Fire Protection, and Heating, Ventilating and Air Conditioning Contractors are each to consider the word "Contractor" when used in these Sections to mean themselves.

C. All Plumbing, Fire Protection, and Heating, Ventilating and Air Conditioning Contractors must read the entire Specification and all divisions therein because they will be responsible for Work described in other Sections where reference is made to "Mechanical Contractor" or other commonly used terminology that implies the Plumbing Contractor, Fire Protection Contractor, or Heating, Ventilating and Air Conditioning Contractor.

D. Plumbing Contractor shall provide temporary water, unless otherwise assigned in Division 1. Heating, Ventilating and Air Conditioning Contractor shall provide temporary heat, unless otherwise assigned in Division 1.

E. All work included under this heading is subject to the Bidding Requirements, General Conditions, and Division 1 General Requirements written for this entire Specification, whether attached to this Part or not, and the Contractor is notified to refer thereto as an integral part of the work.

1.02 APPLICABLE SECTIONS

A. Contractors shall perform work described in the preceding paragraphs, the General Conditions, Division 1 and in the following Sections (as included):

1.	Fire Protection:	Sections 20 00 00 through 20 99 99
		Sections 21 00 00 through 21 99 99
2.	Plumbing:	Sections 20 00 00 through 20 99 99
		Sections 22 00 00 through 22 99 99
3.	HVAC:	Sections 20 00 00 through 20 99 99
		Sections 23 00 00 through 23 99 99

B. Contractors are required to coordinate their work with that described in other Sections, and therefore, must familiarize themselves with the entire set of Specifications.

1.03 RESPONSIBILITY

A. The Engineer's efforts under this contract are aimed at designing a project that will be safe after full completion. The Engineer has no expertise in, and assumes no responsibility for, construction means and methods, nor job site safety during construction. These are exclusively the Contractor's responsibility. The Engineer may process or approve Contractor submitted means or methods that may contain information related to construction methods or safety issues. The Engineer may also participate in meetings where such issues might be discussed. Such processing or participation shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

END OF SECTION

SECTION 20 05 05
PLUMBING, FIRE PROTECTION, AND HVAC GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish all materials, labor, tools, and equipment to complete and leave ready for operation all Fire Protection, Plumbing and Heating, Ventilating and Air Conditioning (HVAC) systems.

B. By submitting a Bid, the Contractor certifies that:
1. The Contractor has visited the site and is satisfied that he/she understands all site conditions that may affect his/her Bid price, with the sole exception of those items which he/she specifically is taking exception to in writing in his/her Bid.
2. The Contractor fully understands the make-up, construction, and operation of all systems and equipment he/she is bidding on and has included in his/her price all materials, supplies, accessories, and services necessary to make these systems complete and operational, whether such materials, supplies, and services are explicitly shown on the Drawings or included in these Specifications or only implied by the clear intent of these Documents that the Contractor provide a complete and fully operational system as part of the scope of work undertaken by this Contractor.

C. These General Requirements are in addition to the other requirements referenced elsewhere within these Specifications.

1.02 ENVIRONMENTAL GUIDELINES

A. Comply with all Project Requirements in Division 01 for Construction Waste Management.

B. Minimize the use of virgin materials and minimize waste during construction.

C. Use low-VOC mastics and sealants.

1.03 STANDARDS OF QUALITY

A. Provide quality work conforming to the best accepted practice and standards of the trade. Further definition of quality is given by reference to various laws, codes, standards, and regulations.

B. All laws and codes having jurisdiction over this project are deemed to be included in their entirety as a part of these Specifications. Also, any other laws, codes, standards, or regulations referenced herein are deemed to be included in their entirety.

C. If a conflict occurs between the Drawings, the Specifications, and the applicable codes, immediately call the conflict to the attention of the Architect before bids are submitted. The Architect will determine which interpretation shall take precedence. Conflicts not brought to the Architect's attention before bids are due shall be priced by the Contractor to include the most expensive, highest quality alternative.

D. Material and equipment installed under this Contract shall be new, undeteriorated, and of a quality not less than the minimum specified. All equipment shall be certified, listed, and labeled by UL. If UL does not certify an associated piece of equipment, then certification by another nationally recognized testing laboratory such as CTL shall be permissible. If equipment is of a type that no testing lab lists nor labels, then a safety evaluation must be performed at the supplier's expense by the inspecting authority or another federal, state, or municipal agency.

E. The following codes apply to this work (as approved and amended by the Authority Having Jurisdiction including all applicable sections of interim agreements in effect at the time of permit issuance):
   1. Local
      a. Building Code
      b. Fire Code
   2. State of Ohio
      a. Ohio Building Code
      b. Energy Conservation Code
      c. Mechanical Code
      d. Plumbing Code
      e. Pressure Piping Code
      f. Fire Code
   3. National
      a. National Fire Protection Association (NFPA) Codes as listed in subsequent Sections and Article 101
      b. Power Piping ASME B31.1
      c. Refrigeration Piping ASME B31.1
      d. All applicable OSHA Requirements
      e. All applicable EPA Requirements
      f. Industrial Risk Insurers (IRI)

F. Work must be performed by licensed Contractors as required by Local and State Codes.

G. Methods and materials must be certified where noted in the individual Specification Sections.

H. All equipment and appliances must bear a tag or label of an Approved Testing Agency. Review Local Code requirements.

I. Work must comply with Ohio Building, Mechanical, Plumbing, and Fire Codes. Unless otherwise noted, the latest enforced code edition shall apply to this work.

J. If the hardware or software installed under this Contract interacts with any existing systems that do not already have this feature, this Contractor is to notify the Owner, in writing and in a timely manner, of the specific changes that the Owner must make to the existing systems to bring the combined system into compliance with this requirement.

1.04 CONTRACT DRAWINGS

A. Drawings are schematic and show approximate locations and extent of work. Exact locations and extents must be coordinated with other Contractors and verified in the field. Coordination of the final fabrication drawings and final coordination of the installation in the field is the Contractor's responsibility. The Contractor is to take the design to the next level of detail, knowing exactly what equipment and materials he/she is going to provide, and build the project on the basis of that equipment and other approved Shop Drawings.

B. The Drawings indicate required size and points of termination of pipes and ducts and suggests proper routes to conform to structure, avoid obstructions, and preserve clearances. However, it is not intended that Drawings indicate all necessary offsets, and the Contractor shall, without further instructions or additional cost to the Owner, make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom, and keep openings and passageways clear.

C. When the work as indicated on the Contract Drawings exceeds the minimum required by any code, standard, requirement, rule, or regulation, the Contract Drawings shall govern the design and installation of the work.

D. Significant deviations from Drawings must be approved by the Architect.

E. Up to the time of roughing in, the Architect reserves the right to make minor changes in location that do not require additional labor or material. No cost shall be added to the Contract for a minor change. The Architect shall determine what is a "significant" and what is a "minor" change.

1.05 ABBREVIATIONS AND SYMBOLS

A. Listed below are titles and abbreviations used in the Specification. All may not necessarily apply to this work.

1. AABC Associated Air Balance Council
2. ADA Americans with Disabilities Act
3. ADC Air Diffusion Council
4. AGA American Gas Association
5. AMCA Air Movement and Control Association
6. ANSI American National Standards Institute
7. ARI Air Conditioning and Refrigeration Institute
8. ASA Acoustical Society of America
9. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
10. ASME American Society of Mechanical Engineers
11. ASSE American Society of Sanitary Engineers
12. ASTM American Society for Testing and Materials
13. AWWA American Water Works Association
14. BAS Building Automation System
15. CGA Compressed Gas Association
16. CISPI Cast Iron Soil Pipe Institute
17. EJMA Expansion Joint Manufacturers Association, Inc.
18. EPA Environmental Protection Agency

19. FM Factory Mutual
20. HVAC Heating, Ventilating, and Air Conditioning
21. MSS Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
22. NEBB National Environmental Balancing Bureau
23. NEC National Electrical Code
24. NEMA National Electrical Manufacturers Association
25. NFPA National Fire Protection Association
26. NSF National Sanitary Foundation
27. OAC Ohio Administrative Code
28. OBC Ohio Building Code
29. ODH Ohio Department of Health
30. ODMH Ohio Department of Mental Health
31. ODOE Ohio Department of Energy
32. ODOT Ohio Department of Transportation
33. OSHA Occupational Safety and Health Administration
34. PDI Plumbing and Drainage Institute
35. SMACNA Sheet Metal and Air Conditioning Contractors National Association
36. TAB Testing, Adjusting, and Balancing
37. UL Underwriters' Laboratories

B. The abbreviations are shown on Drawings. For further abbreviations, Contractor shall refer to the symbols list shown in the latest ASHRAE Fundamentals Handbook.

1.06 DEFINITIONS

A. Applicable definitions as listed by Ohio Building Codes apply to this work.

B. "The Authority Having Jurisdiction" shall refer to any duly authorized governmental body or public utility and/or their agents having jurisdiction over the work as provided under this Contract.

C. "Concealed": Embedded in or installed behind walls, within partitions, above suspended ceilings, in trenches, in tunnels, below floor slabs, and within crawl spaces. Items within mechanical rooms are not considered "concealed."

D. "Contractor": Means the Contractor whose scope of work is described within Divisions 20, 21, 22, or 23.

E. "Ductwork": Duct and fittings, dampers, vanes, controls, hangers, bracing, insulation and other items required or necessary.

F. "Exposed": Not installed underground or "concealed," as defined previously. In full view, all items within a mechanical room are considered "exposed."

G. "Furnish": To purchase and deliver products to the project site and make ready for installation.

H. "Install": To take furnished products, assemble, erect, secure, connect, and place into operation.

I. "Piping": Pipe, fitting, flanges, valves, controls, specialties, hangers, concrete inserts, bracing, insulation, and other items required or necessary.

J. "Products": Includes materials, systems, and equipment.

K. "Provide": To furnish, erect, install, and connect to make completely ready for regular operation.

L. "Work": The providing of products for entire Contract.

1.07 PERMITS, FEES, AND NOTICES

A. Secure and pay for all permits and governmental fees, bonds, licenses, and inspections necessary for the proper execution and completion of the work. Refer also to specific permit requirements in other Sections of Divisions 20, 21, and 22 (as included) and in Division 1.

B. Give notice and comply with all laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the work.

C. The Plumbing, HVAC, and Fire Protection Contractors shall arrange for inspection of the work by the Code Authority having jurisdiction.

D. If the Contractor performs any work knowing that work to be contrary to such Laws, Ordinances, Rules and Regulations, and without notice to the Architect, the Contractor shall assume full responsibility for and shall bear all costs associated with such work.

1.08 EXAMINATION OF SITE

A. Certain existing conditions affect the manner or sequence of the work performance. Review existing services, structures, and operating schedules to facilitate installation of the Work. Coordinate scheduling of the work with existing operations.

B. Visit the site of the proposed project and familiarize with all conditions which might affect the work. After the Contract is signed, no allowance will be made for lack of knowledge of project conditions.

C. Prior to bidding the project, verify and reconcile work required by the Contract Documents with conditions at the Site.

D. Should any discrepancies be noted during the Bidding Period, notify the Architect immediately, in writing, to permit the issuance of an addendum to prevent misunderstandings at a later date.

1.09 UTILITIES

A. Prior to construction, locate any existing utilities within the project limits. Make minor relocations to permit installation of work. Advise the Architect immediately of major conflicts on a site plan layout to permit modifications of the Contract Documents, and submit to the Architect for review prior to any excavation. Where existing utilities conflict with new work, mark and identify proposed modifications on the site plan layout.

B. Record locations of all concealed utilities on the Record Drawings.

C. Coordinate any utility service shutdown or outages with the Architect and the Owner. Shutdowns shall conform to all utility company requirements. Avoid inconveniencing the Owner, and provide temporary service during the curtailment, as required by the Architect or Owner. Provide five (5) working days (minimum) advanced notice to the Owner for any required utility outages.

D. At least two (2) working days prior to construction in an area in which underground utility facilities may be located, notify the Project Engineer, the registered utility protection service, and the Owner of each underground utility facility listed here:
1. Utilities Protection Service
   Phone: 1-800-362-2764
2. Columbia Gas of Ohio
   New Business Team
   290 West Nationwide Blvd.
   Columbus, Ohio 43215
   Phone: 1-800-440-6111
3. Del-Co Water Company
   Cris Valenzuela
   6658 Olentangy River Road
   Delaware, Ohio 43015
   Phone: 740-548-7746
4. Delaware County Regional Sewer District
   Kelly Theil
   50 Channing Street
   Delaware, Ohio 43015
   Phone: 740-833-2240
5. Delaware County Department of Building Safety
   50 Channing Street
   Delaware, Ohio 43015
   Phone: 740-833-2200

1.10 CONTRACTOR DESIGN/DETAILING

A. The Contractor is required to include the design of component parts, subsystems, and installation details as required by the Specifications, as indicated on the Drawings, and as required for a complete and operating installation. This design work shall be done after all equipment manufacturers and material types have been selected from those allowed by the Specifications. If required by the Specifications, submit design calculations for review. Obtain the services of qualified personnel to perform this design and detailing. The Contractor's design and detailing does not relieve the Contractor from complying with the Contract Documents.

1.11 RECORD DRAWINGS

A. Maintain at the job site one (1) copy of Drawings, which shall be used exclusively for recording the location of all installed work.

B. Record deviations in locations of concealed piping, valves, all buried or concealed utility services (water, gas, fire, manholes, etc.), dimensioned from a fixed control point, including depth of bury at start of gas line, at each change of direction as required for further reference. Minor piping variations need not be recorded. Record Addendum and Change Order Items.

C. Record deviations necessary to incorporate equipment different from the Design Base equipment.

D. At completion of the project, deliver Record Drawings and Coordination Drawings to the Architect.

E. For large, complex electrical equipment, supply and post at, on, or near the equipment, all electrical power and control drawings. Provide framed glass or plastic protection for the Drawings.

F. Diagrams and Operating Instructions: Post complete diagrams and operating instructions for all control systems near the related equipment. Provide framed glass or plastic protection for the Drawings and operating instructions. When multiple equipment rooms exist in a building, these diagrams shall be required at each piece of equipment. Additionally, post or make available in the main equipment room a complete set of diagrams.

G. Refer to Division 1, Section 01 74 01, "Execution Requirements," for additional requirements.

1.12 GUARANTEE

A. Guarantee equipment, workmanship, and materials for one (1) year from date of Contract Completion. If defects develop within this guarantee period, and upon receiving written notice from the Architect or Owner, remedy the defects and reimburse the Owner for all damage to other work caused either by the defects or during the work of correcting the defects.

B. Refer also to Division 1 and any individual Sections that define the starting date of the guarantee period or discuss either additional warranty requirements or extended warranties beyond the standard period.

1.13 COORDINATION

A. Coordinate work carefully with the work of all other Contractors.

B. Consult all contract documents that may affect the locations of any piping, and make minor adjustments in location to secure coordination.

C. Before proceeding, coordinate drilling, welding, etc., and method of attachment to columns, joists, beams, girders, etc., with Structural Engineer and General Trades Contractor.

1.14 TEMPORARY UTILITIES

A. Refer to Division 1, General Requirements.

B. Any and all equipment used for temporary building operation during construction shall be contingent on a plan submitted by the Contractor and approved by the Construction Manager and the Engineer. The criteria shall include, but not be limited to, the following:
   1. All necessary controls shall be in place and functional.
   2. All equipment safeties shall be functional.
   3. The equipment shall not be operated without the design filters in place and the filters shall be changed in accordance with the criteria on the Air Filter Schedule. Refer to Section 23 41 05 Filters for more information.
   4. Maintenance of the equipment shall be as recommended by the manufacturer and shall be the responsibility of the Contractor.
   5. The operation of the units for construction shall not affect the required warranty terms and times at the completion of the building.

PART 2 PRODUCTS

2.01 DESIGN-BASE MANUFACTURERS

A. The Drawings and Specifications are based on the requirements and layouts of the equipment of the Design-Base Manufacturers. Design of equipment has been coordinated with the building and other Trades for these specific models and manufacturers of equipment. Where several manufacturers are listed, the first named is the Design-Base Manufacturer, unless specifically noted otherwise. Submit for final approval products of the listed manufacturers that are of performance and quality comparable to the Design-Base Manufacturer's products.

B. Where necessary, prepare new layouts to be used for other equipment listed. Adjust and coordinate the layouts with the equipment and service requirements and with Code-required working clearances that may have different dimensions or service requirements from the Design-Base Manufacturer's equipment. Verify that this equipment will fit and function in the indicated application and will coordinate with adjacent equipment for fit and clearances. Submit all new layouts as part of the shop drawing review.

C. Whenever the Contractor furnishes equipment or material other than that of the Design-Base Manufacturer, he/she is responsible for the cost and coordination of all modifications required not only for his/her work, but also for the work of all other Trades affected. Where changes to other Trades' work are required, the Contractor furnishing the equipment or material must include the additional costs of all such changes in his/her Bid, arrange with these other Trades for the changes, and compensate them accordingly.

2.02 APPROVED EQUALS

A. Equal (equivalent) components (articles, materials, forms of construction, equipment, fixtures, etc.) by manufacturers not listed but meeting the Specifications may be submitted to the Architect for approval and subsequent inclusion into the bidding documents. Submittal must be received no later than ten (10) working days before bid date. If approved, such manufacturers will be listed in an addendum.

B. Submittals must include all of the following:
   1. Cover Letter: Company letterhead addressed to Architect. Indicate the following:
      a. Project name, project building name, project number, and phase or bid package if applicable
      b. Specification Section by number and title
      c. Specified Product
      d. Proposed Product
      e. Deviations, if any, from Specified Product
      f. List of attachments
   2. Product Data: Manufacturer's literature, fully describing proposed product with exact item highlighted or clearly indicated.
   3. Specifications: Manufacturer's Specifications with all modifications noted as required to show compliance with Bidding Documents.
   4. Test Data: Where performance requirements are specified, submit laboratory tests to indicate compliance.
   5. Samples: When required by Architect, submit appropriate samples of proposed product showing color, texture, construction and other attributes necessary for evaluation.

C. If the Contractor fails to comply with all of the preceding requirements and fails to provide all of the requested information, the submittal will not be reviewed.

2.03 SUBSTITUTIONS

A. Contractor may submit equipment and material substitutions of his/her choice, without prior approval, on the "Substitution Sheet" included in the Bid Schedule. Such substitutions will not form the basis of the award and may be considered only after selection of the lowest bidder furnishing "Standards" as specified.

2.04 MANUFACTURER'S DECLARATION

A. Submit a list of the suppliers to be used on this project within thirty (30) days of award of contract. Type this list on company letterhead and include the project title. Include all equipment listed in Section 20 05 15, "Submittals." Adjacent to each Specification Section number and product description, list the manufacturer and catalog number/type.

2.05 QUANTITIES

A. Equipment may be referred to either in these Specifications or on the Drawings, as singular or plural; Contractor is responsible for verifying the exact number of items required to complete his/her work.

2.06 OWNER-FURNISHED EQUIPMENT

A. The Owner will furnish certain items of equipment to the Contractor. The Contractor shall take delivery of such items and unload them from the truck at the job site.

B. The Contractor shall protect and store such items as part of this Contract.

C. The Contractor shall install these items in conformance with the requirements of the Specifications and Drawings and the supplier's recommended installation instructions.

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

A. Unless otherwise required in the General Conditions and other Specification Sections, the Contractor shall include in his/her Bid the cost of all cutting and patching required for his/her work. Work must be accomplished in a neat and workmanlike manner that is acceptable to the Architect.

B. If necessary to cut into the work of other Trades, the other Trades shall do the cutting in at this Contractor's expense. Patching shall be done in the same fashion.

C. Cutting of structural support beams, joists, plates, precast, or other structural members is strictly prohibited without the specific written consent of the Architect and Structural Engineer. Use rotary drills where cutting holes through concrete, brick, plaster, or tile is necessary. Obtain approval of the Architect before proceeding with work.

D. All cutting and patching shall be done promptly and all repairs shall be made as necessary to leave the entire work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, and other materials as specified or required for proper assembly, fabrication, installation, and completion of all work of the Contract.

E. Patching shall match adjacent materials and shall be accomplished only by tradesmen skilled in the respective craft required. Materials and equipment used in the patching work shall comply with requirements of those Sections of the Specifications relating to material to be used in new construction. Contractor is not necessarily obliged to employ the General Trades Contractor to do patching. The HVAC, Plumbing, and Fire Protection Contractors shall incur all cost for cutting and patching necessary for their installation of their respective work.

F. Patch to match adjacent surface construction. Exception: Portions of the existing floor slab shall be cut and removed by Contractor and replaced by the other Contractors is appropriate for the underfloor plumbing piping. Plumbing Contractor shall excavate and backfill for his/her own work.

G. Patch and repair holes in walls, ceilings and floors that are left as a result of removing ductwork, piping, or other mechanical elements or as necessary to install the work related to this project. Match adjacent surface conditions. Coordinate patching with architect and work of other trades.

H. Refer to Division 1 and Division 2 for additional requirements.

3.02 PAINTING AND RELATED WORK

A. Finish painting in areas of new construction and remodeled areas is the responsibility of the General Trades Contractor and is specified in Division 9.

B. Any other painting required by Sections of Division 20, 21, 22, or 23 is the responsibility of the respective HVAC, Plumbing, or Fire Protection Contractors. Such painting shall be done by a qualified tradesman skilled in the craft and shall meet the requirements of Division 9. Each Contractor is responsible for repainting of finished areas disturbed by his/her own cutting and patching. Finishes shall match existing conditions.

C. If factory-finished equipment has rusted or has been damaged, clean the equipment, spot prime it with zinc chromate, and finish it to the original quality and color.

D. Clean HVAC, Plumbing, and Fire Protection support steel and bare ferrous metal, remove all rust, apply primer, and paint in accordance with Division 9 Specifications.

E. Prime and finish all plywood mounting boards in accordance with Division 9 Specifications.

3.03 CLEANING

A. Upon completion of work, thoroughly clean of dirt, stickers, grease, rust, oil and other foreign matter, all material, fixtures and equipment furnished in this Contract. Prepare for finish painting, where painting is specified.

B. Clean galvanized piping and ductwork in exposed areas with diluted acetic acid.

C. Clean copper piping in exposed areas with fine emery cloth and solvent.

D. Clean all gauges, thermometers, traps, dirt legs, strainers and fittings.

E. Clean all insulation coverings.

F. Keep all areas as clean as possible during construction. Refer to Division 1 for additional requirements.

3.04 SCAFFOLDING, RIGGING, HOISTS, AND TRANSPORTATION

A. The Contractor shall provide scaffolding, staging, cribbing, tackle, hoists, and rigging necessary for placing of his/her materials and equipment in their proper places in the Project.

B. The Contractor shall pay costs for transportation of materials and equipment to the job site and shall include such costs in his/her proposal. The Contractor shall pay costs for storage of materials and equipment if space is not available at the site and shall include such costs in his/her proposal.

C. Scaffolding and hoisting equipment shall comply with requirements of applicable Federal, State, and Local Laws and Codes.

3.05 TESTS

A. The Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction may require portions of the work to be inspected, tested, or approved. These services shall be performed by approved agencies.

B. The Architect must receive notification of all scheduled tests and adjustments at least 72 hours before they are scheduled so he/she may witness the tests and adjustments. If the Contractor performs any test or adjustment without the Architect present or without proper notification, the Contractor may be required to perform the test or adjustment a second time at the Contractor's expense. To minimize inconvenience, all test schedules shall be coordinated with the Owner.

C. Secure required certifications of inspection, testing, or approval and include those in the Service Manuals. See Section 20 05 20, "Record and Information Manuals."

D. Test and secure approval after the piping installation has been completed, but before the piping has been concealed and before the pipe covering has been applied. Each system shall be tested as required by other Sections of this Specification. The piping shall be free of leaks at the test pressure. If a leak appears, repair the line and any damage resulting from the leak at no additional cost to the Owner. The test shall be repeated until the system is proven to be free of leaks and properly anchored.

E. Should any of the work be covered up or enclosed before all required inspections are completed and approvals obtained, uncover the work as required and, after the work has been completely inspected and approved, make all repairs and replacements, with such materials and workmanship as are necessary for the approval of the Architect. Do so at no additional cost to the Owner.

3.06 TESTING PROCEDURES

A. Provide all tools, instruments, personnel, and equipment required to perform tests. Make all required temporary connections. Properly repair defects that develop under tests and repeat the tests. Do not caulk threaded joints, cracks, or holes. Repair leaks by tightening threaded joints or by replacing pipe, fittings, or equipment with new materials. Minor leaks in welded joints may be chipped out and rewelded.

B. Perform hydrostatic and air tests before piping is concealed or covered. Completely drain all systems after hydrostatic tests are performed.

C. Testing of service lines shall follow recommended practices. Remove all air from lines when testing with water pressure, to avoid false pressure readings.

3.07 INSPECTION

A. Check each piece of equipment in the system for defects. Verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

3.08 PROTECTION

A. Do not deliver equipment and material to the site until the work is ready to receive it, unless it can be protectively stored in a manner acceptable to the Architect.

B. During construction, protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.

C. Elevate and protectively cover all materials or equipment stored outside.

D. Store inside all materials and equipment sensitive to weather or construction conditions. Where necessary, store sensitive equipment in a heated area.

E. During construction, cover all non-operating motors, bearings, and controls that are stored or installed in place.

F. Refer also to individual Specification Sections for specialized protection.

G. Immediately repair or replace damaged equipment or materials to the satisfaction of the Architect and at no additional cost to the Owner.

H. Protect the building and other Contractor's material and equipment from damage caused by your work. Protect floors from cutting oil and chips.

I. Use all means necessary to protect materials before, during, and after installation.

3.09 NOTIFICATION OF START-UP

A. Notify the Architect of the start-up schedule for all equipment. The Architect shall then notify the Owner.

3.10 WATER MANAGEMENT PROGRAM (WMP)

A. The Plumbing Contractor shall establish, manage and execute a Water Management Program for the plumbing and fire protection systems of the project from the beginning of construction through one (1) month after the building is occupied by the Owner. The purpose of the program is to manage the risk of biological contamination of the components of the potable water system such as Legionella.

B. The Contractor shall review the contract documents to determine factors and aspects of the systems that may relate to possible biological contamination such as Legionella, but not limited to Legionella. These may be related to the arrangements, phasing and temporary operation of the plumbing and fire protection systems and to the equipment attached to these systems. Factors and equipment include, but are not limited to, the following:
1. Fountains
2. Ice machines
3. Other devices that release water aerosols into the building
4. Construction Phasing that results in stagnant water or water temperature variations in the systems

C. The Contractor shall identify piping, devices and equipment, and control locations, that require control measures. Monitoring, additional cleaning and additional disinfection shall be provided for these locations.

D. Cleaning of the potable water system and components shall occur as the systems are constructed and a final cleaning, flushing, and disinfection shall take place before the systems are commissioned or started. If after the systems are filled, commissioned or started, the systems are shut down, become stagnant or the system temperature is not maintained below 65°F or above 140°F, the systems will be cleaned, flushed, and disinfected again before placing them back into service.

E. The Contractor shall document the protocol and procedures used to sanitize the systems, the disinfectant used, and the concentration achieved at branch terminals sampled throughout the systems.

3.11 PROTECTION FOR PUBLIC AND EMPLOYEES

A. Refer to Division 1, General Requirements.

3.12 TEMPORARY FIELD OFFICE AND MATERIALS STORAGE

A. Refer to Division 1, General Requirements.

3.13 USE OF EXISTING FACILITIES

A. Refer to Division 1, General Requirements.

3.14 DEMOLITION AND REMOVAL

A. Refer to Division 1, General Requirements.

END OF SECTION

SECTION 20 05 10
COORDINATION BETWEEN TRADES

PART 1 GENERAL

1.01 DESCRIPTION

A. Plumbing, Fire Protection, HVAC, and Electrical Contractors shall coordinate their rough-in, service, and control wiring requirements with each other. Electrical Contractor shall review all control Drawings to coordinate exact number of temperature control panels, as well as to provide proper starters (including necessary time delays, auxiliary contacts, etc.).

B. Equipment drawing 1,000 watts or more, before power factor correction, must have a power factor of 85% or greater at rated load conditions. Equipment with an operating power factor of less than 85% shall be corrected to at least 90% under rated load-operating conditions. The Contractor furnishing the equipment shall be responsible for power factor correction devices.

C. The Electrical Contractor shall install all wiring required to power Plumbing, Fire Protection, or HVAC equipment, including 120 volt to control panels as shown. The Contractor furnishing the control device is responsible for all control and interlock wiring, regardless of voltage, except if the control device actuates or is actuated by the fire alarm control panel. The Electrical Contractor shall be responsible for this wiring from the fire alarm control panel to the control device. The Contractor providing a control panel shall extend control power for temperature control panels required, but not shown on the Drawings from the nearest available breaker to the control panel.

D. Each Contractor furnishing motors is responsible for advising Electrical Contractor of the exact function of the systems to assure proper type of starter (including necessary time delays, etc.) with correct number of auxiliary contacts required for proper system operation. If motors that require larger starters, safety switches, circuit breakers, fuses, or branch circuit conductors than indicated are furnished, the Contractor furnishing the motors shall reimburse the Electrical Contractor for any cost differential.

E. All electrical devices furnished as part of Plumbing, Fire Protection, and HVAC equipment, and the installation requirements for all electrical work included in the project, shall conform to all other applicable Sections of these Specifications.

F. The Plumbing, Fire Protection, and HVAC Contractors shall be responsible for start-up, commissioning, and final operation of equipment provided under their respective contracts and shall demonstrate the operation of all systems to the Owner. Provide the appropriate personnel for the checkout of the building life safety systems and for the life safety system demonstration to the Authorities having jurisdiction.

1.02 COORDINATION

A. The Plumbing, Fire Protection, HVAC, and Electrical items are listed in the Coordination Schedule, with key letters and numbers to identify the responsibility of each Contractor. The following two (2) paragraphs describe the key numbers and letters.

B. Combinations of Contractors doing the different parts of the work are identified as follows:
   1. To be furnished and installed by Plumbing, Fire Protection, or HVAC Contractor supplying the equipment.
   2. To be furnished and installed by Electrical Contractor.
   3. To be furnished by Plumbing, Fire Protection, or HVAC Contractor and installed by Electrical Contractor.
   4. To be furnished by Owner and installed by Plumbing, Fire Protection, or HVAC Contractor.
   5. To be furnished by Owner and installed by Electrical Contractor.

C. The items to be furnished are identified by key letters as follows:
   A - Disconnect
   B - Line voltage starter
   C - Reduced voltage starter
   D - Combination disconnect starter
   E - Factory pre-wired control panel with integral starter
   F - Variable Frequency controller
   G - Duplex outlet

1.03 COORDINATION SCHEDULE

ITEMS	A	B	C	D	E	F	G
Plumbing:							
Water heater	2				1		
Disposer	2				1		
Electric water cooler	2						2
Automatic faucets	2						
HVAC:							
Fan Coils / VRF Indoor units	2	2					
DOAS Indoor Unit	2				1		
Air Cooled Condensing Unit / VRF Outdoor unit	2				1		
Unit heater (electric)	2				1		
Electric baseboard heater	1						
Cabinet unit heater	1				1		
	A	B	C	D	E	F	G

1.04 BUILDING AUTOMATION AND TEMPERATURE CONTROL

A. Coordinate all Building Automation System and Temperature Control System components and installation as noted in Specification Sections governing that work.

END OF SECTION

SECTION 20 05 13
MOTORS

PART 1 GENERAL

1.01 DESCRIPTION

A. All motors provided as part of equipment or appliances that are driving pumps or fans shall meet the requirements stated within this specification.

B. Motors 1/2 horsepower or smaller shall be single phase; larger motors shall be 3 phase, unless otherwise noted.

1.02 QUALITY ASSURANCE

A. All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, IEEE, and ASTM.

B. Motors must meet or exceed CEE Premium Efficiency™ full load efficiencies.

C. The motors shall be provided with a three (3) year full parts and labor warranty, commencing at Project Completion. Warranty periods that begin at startup or on a ship date are not sufficient.

1.03 MANUFACTURERS

A. Baldor Electric, Reliance, Lincoln, General Electric, US Motors, Marathon.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. Conformance with all sections of the Specifications is required.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION

A. Motors shall be ODP (Open Drip-proof) or TEFC (Totally Enclosed Fan-Cooled), or TEAO (Totally Enclosed Air Over) as noted in individual product specifications, NEMA T frame, NEMA F1 assembly for horizontal applications. Enclosures shall be rolled steel band or cast iron construction depending on horsepower. End brackets shall be die cast aluminum with steel bearing inserts or cast iron construction. Conduit box shall be die cast aluminum or cast iron construction. Provide shouldered lifting eyebolts or cast provisions within the frame for handling convenience.

B. The manufacturer shall be notified that the motor will be used in conjunction with a variable frequency drive. It shall be the responsibility of the motor manufacturer to ensure that this motor will be capable of operating under the torque requirements and speed range within temperature specifications. Motors shall be designed to be used with variable frequency drives (VFD) and shall be inverter-ready.

C. Motor nameplate shall be mounted on enclosure with stainless steel fastening pins. Nameplate shall have, as a minimum, all information as described in NEMA Standard MG-1-20.60.

D. Motor terminal boxes shall be sized larger than required by NEC or UL standards, pipe drilled for conduit and shall be attached to the motor frame with cadmium-plated hex head cap screws. Cover shall be installed with cadmium plated hex head cap screws. The conduit box shall come completely assembled to the motor. Motor leads in the conduit box shall be sized in accordance with NEC suggested minimum ampacity values using a minimum of 125 degrees C insulated lead wire.

2.02 RATINGS AND DESIGN

A. Motors shall be premium efficiency, squirrel cage, induction type. Motors shall be rated in accordance with NEMA Rev. 1, Part 31.40.4.2 with 1600 volt insulation and meet the tabulated efficiencies at full-rated RPM.

B. Minimum efficiencies for ODP motors shall be equal to or greater than those shown below:

HP	1200 RPM	1800 PM	3600 RPM
2	87.5	86.5	86.5
3	89.5	89.5	86.5
5	89.5	89.5	89.5
7.5	91.7	91.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0
40	94.1	94.1	93.6

C. Motors shall be wound for 460 or 208 volt (as required), 3 phase, 60 Hz, 1.15 service factor.

D. Windings shall be copper magnet wire rated at 200 degrees C and moisture resistant. Motor insulation system shall comply with NEMA MG1-1998 Part 31.4.4.2.

E. Motors shall be furnished with standard NEMA T-frame shaft for V-belt drives even if motors are for direct connected drive duty. In general, motor shall be interchangeable for horizontal, vertical or belt-driven mounting.

F. Rotors shall be keyed and shrunk or pressed to the shaft. Keyed rotors shall be press-fitted on a shoulder the full length of the rotor utilizing the full shaft surface diameter.

G. Provide AEGIS shaft grounding rings on all motors operated by variable frequency drives to divert shaft voltages and bearing currents to ground. Motors up to 100 horsepower in size shall have one ring installed on either the drive end or the non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. All grounding rings shall be installed in accordance with manufacturer's installation instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Properly tension and align drive belts.

B. After units have been operating for 48 hours, check all bearings, belts and sheaves. Tighten sheaves and tension belts as necessary.

C. Operate system for a minimum period of 7 consecutive days with no problems before final acceptance.

END OF SECTION

SECTION 20 05 15
SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

A. For general requirements, refer to the GENERAL CONDITIONS and Division 1.

B. Materials and equipment installed in this work shall meet all the requirements of the Contract Documents and no materials or equipment shall be ordered until submittals are reviewed and approved by the Contractor, Architect, and Engineer.

C. Contractors assume all responsibility for changes required as a result of work performed, or equipment ordered, by the Contractor prior to submittal approval.

D. Submit complete copies of the catalog data or Drawings for each manufactured item of equipment and each component to be used in the work as required in the table below. Catalog data shall include specific performance data, utility requirements, service area required, material description, rating, capacity, working pressure, dimensional data, material gauge or thickness, wiring diagrams, brand name, catalog number, and general type.

E. Submittals reviewed by the Engineer shall not take precedence over the Contract Documents, and the Engineer's review shall not relieve the Contractor from the responsibility for complying with the Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Trades.

F. When submitted for review, all shop Drawings shall bear the Contractor's certification that he/she has reviewed, checked, and approved the shop drawings, that they have been coordinated with the requirements of the project and the provisions of the Contract Documents, and that he/she has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. Submittals without a Contractor's approval will not be reviewed and will be returned.

G. Submittals shall include the complete package of equipment materials, piping, and insulation pertaining to that piece of equipment. A package of equipment requiring long lead times may be submitted earlier.

H. The Engineer's review and approval does not extend to means, methods, manners, techniques, sequences, procedure of construction or to safety precautions or programs incident thereto. This is solely the Contractor's responsibility.

I. Shop Drawings that are submitted, but are not required by the table below, will not be reviewed, and they will not be returned.

J. Shop Drawings that are indicated to be provided for Record Purposes only will not be reviewed, and they will not be returned.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Completely review and approve shop Drawings, product data, and samples prior to submittal.

B. Determine and verify:
1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with Specifications
5. Quantities

C. Coordinate each submittal with requirements of the work and the Contract Documents and other Trades.

D. Notify the Architect in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents. The Contractor must boldly note all deviations on the submittal.

E. Make submittals promptly in accordance with the approved schedule and in such sequence as to cause no delay in the work of the Contractor or any other Contractor.

F. Correct or change and then resubmit rejected submittals as required until approved. The Contractor must clearly note all revisions on resubmitted submittals. Resubmittals without the revisions noted may be returned without review.

G. Do not begin fabrication or work that requires submittals until approved submittals are returned.

1.03 CERTIFICATIONS

A. Provide:
1. Test Agency results verifying capacities, operating conditions and power requirements at design conditions. Test Agencies are to be hired by the Contractor at the Contractor's expense.
2. Manufacturer's Statement of Compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, for example, each pipe length, pressure vessel, or valve.
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

1.04 REQUIRED SUBMITTAL INFORMATION (ALSO REFER TO DIVISION 1)

A. Submittal Transmittal
1. Provide the following information on the Transmittal Form for each submittal:
a. Project name
b. Specification number for each submittal item required in table below

c. Item description, as listed for each submittal item required in table below. Where equipment is identified by number or tag on the documents, use the same identification on the submittal.
d. Specification number and item description (b and c, preceding) for each submittal if more than one (1) submittal is sent under one (1) transmittal form.
e. Name, address, and telephone number of Contractor.
f. Bid package number.

2. Submittal transmittal forms not properly identified with the preceding information will be returned (without review) to the Contractor.

B. Shop Drawing Requirements

1. Shop Drawings – Provide catalog cuts, Drawings, warranties, motor efficiencies and power factor information (where applicable), wiring diagrams (where applicable), performance curves and characteristics. Shop drawings shall be submitted electronically in PDF file format and as described in Division 1. The submittals will be returned to the Contractor, who will make and distribute as many copies as needed. Only submittals with the approved stamp printed on them shall be permitted on the site.
2. Color Samples of the following items are to be provided:
   a. Cabinet Unit Heaters
   b. Louvers
   c. VRF Cassette Units
   d. Electric Finned Radiation

C. Submit ductwork layout shop Drawings for record purposes only after coordination between all Contractors has occurred. Drawings shall be at 1/4 inch equals 1 foot scale and shall include duct, top and bottom elevations with enlarged sections and elevation plans as necessary. Coordinate size and location of ductwork with structure, piping, lighting, equipment, conduit, bus ducts, ceiling construction, clear height above, and other items that may present a potential conflict. These Drawings will not be reviewed or returned.

D. Submit HVAC piping layout shop Drawings for record purposes only after coordination between all Contractors has occurred. Drawings to be a 1/4 inch equals 1 foot scale with enlarged sections and elevation plans as necessary. Identify all valve locations, as well as all piping and support elevations. Coordinate size and location of ductwork with structure, ductwork, lighting, equipment, conduit, bus ducts, ceiling construction, and Owner's desired clear headroom. These Drawings will not be reviewed or returned.

E. Certain Fire Protection Shop Drawings listed in the table below are to be provided to the Engineer for record purposes only. The final approval for these systems is by the Authority Having Jurisdiction (AHJ). Provide these submittals to the AHJ for their approval prior to installing work. The Engineer will not review or return these Drawings.

F. Each Contractor shall submit information on the equipment items as listed in the following table. Identify each item with Specification numbers.

Section #	Item	Provide for Approval	Provide for Record Purposes Only
	General Items for Plumbing, Fire Protection, and HVAC		
20 05 05	Suppliers and manufacturers list	X	
20 05 20	Record and information manuals	X	
20 05 35	Fire stops through floors and walls		X
20 05 40	Piping expansion, noise and vibration isolation	X	
20 05 45	Hangers, supports, and inserts (Non-Seismic)	X	
20 05 46	Hangers, supports, and inserts for seismic requirements		X
20 05 61	Power factor correction		X
20 05 80	Vibration Isolators	X	
	Fire Protection Contract Items		
20 05 99	Certificate for approval from state fire marshal		X
21 05 02	Fire protection specialties	X	
21 05 23	Fire protection valves		X
21 13 13	Wet sprinkler piping system		X
	Plumbing Contract Items		
22 05 02	Plumbing specialties	X	
22 05 23	Plumbing valves	X	
22 07 01	Plumbing insulation	X	
22 11 01	Combination water service piping system - Water Meter	X	
22 11 16	Pressed and grooved fittings	X	
22 13 16	Floor Drains	X	
22 33 14	Domestic hot water temperature maintenance	X	
22 33 37	Tank type water heaters	X	
22 42 01	Plumbing fixtures	X	
	HVAC Contract Items		
23 05 93	HVAC systems balancing	X	
23 07 05	HVAC Insulation	X	
23 09 23	Temperature control systems	X	
23 09 93	Sequences of Operation	X	
23 31 10	Low-velocity ductwork - Fabrication Drawings		X
23 33 13	Dampers	X	
23 34 17	Fans	X	
23 37 13	Grilles, registers, and diffusers	X	
23 37 14	Louvers	X	
23 41 05	Filters	X	

Section #	Item	Provide for Approval	Provide for Record Purposes Only
23 75 13	DOAS Air handling Unit	X	
23 81 28	Air-cooled condensing units	X	
23 81 28	Ductless split-system air conditioners	X	
23 81 28	Variable refrigerant flow air conditioners	X	
23 81 28	Fan coil units	X	
22 82 36	Baseboard Heaters	X	
23 82 39	Unit heaters	X	

END OF SECTION

SECTION 20 05 20
RECORD AND INFORMATION MANUALS

PART 1 GENERAL

1.01 RECORD DRAWINGS

A. Refer to Division 1 for general requirements as well as for specific information regarding Record (As-Built) Drawings. All drawings shall be provided in electronic PDF format.

1.02 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 for general requirements and for specific information regarding Operation and Maintenance Manuals, including required format(s) (paper and/or electronic) and quantity. If no such requirements are listed in Division 1, provide in electronic format. Submit one (1) copy of draft manual to the Architect for review and approval thirty (30) days before final inspection is due. After approval, submit three (3) approved manuals to the Owner and obtain receipt. (See Section 20 05 99, "Requirements for Contract Completion.")

B. Paper Copy Manuals shall be loose leaf, three-ring, heavy-duty hard-cover binders. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.

C. Electronic Copy Manuals shall be PDF file format. Individual documents shall have filenames corresponding to specification sections and system names. Each document shall have bookmarks corresponding to the systems, subsystems, and equipment names. Use electronic files prepared by manufacturers where available.

D. The following items, together with any other necessary pertinent data, shall be included in each Manual:
1. Each manual to be labeled on front cover with Project name, Contract, Contractor's name, Architect's name, Engineer's name, and date of Project Completion.
2. Manufacturers' names, nearest factory representative (including postal and e-mail address, telephone and fax number), and model and serial numbers of components of systems.
3. Name, postal and e-mail address, telephone and fax number of contact persons handling warranty work and issues.
4. Operating instructions, including start-up and shut-down procedures.
5. Maintenance and lubrication instructions, including routine and emergency service information and instructions.
6. Parts list with numbers of replaceable items (such as couplings and packings). Include sources of supply, with postal and e-mail address, telephone and fax number.
7. One (1) approved copy of each shop Drawing submitted.
8. Temperature control diagrams.
9. Valve charts.
10. Written warranties.
11. Belt sizes, types, and lengths.
12. Wiring diagrams, as actually wired.
13. Testing and balancing reports.

14. Copy of Owner's statement concerning completion of instruction period (see Section 20 05 99, "Requirements for Contract Completion").
15. Routine and 24-hour emergency service and repair information:
    a. Name, post and e-mail address and telephone and fax number of servicing agencies - routine and emergency.
    b. Names of personnel to be contacted for service arrangements - routine and emergency.

1.03 CONTROL DIAGRAM AND VALVE CHART

A. In the main Mechanical Room or location designated by Owner's Representative, mount approved copy in a neat frame with backing under glass or within a plastic jacket.

END OF SECTION

SECTION 20 05 25
EXCAVATION, BACKFILL, AND PROTECTION OF UTILITIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all protection, removal, and relocation of existing utilities and all excavation and backfilling (including concrete) associated with the work of this Division. Protect above grade and below grade utilities that are to remain.

B. Locate all existing utilities and equipment, in all areas of work, and record the actual locations. Take extreme care during excavations to avoid interruption of utilities. Protect above grade and below grade utilities that are to remain.

C. Disconnect all utilities designated for removal or relocation, in conformance with the requirements of the utility company and the Owner.

D. Cooperate with other Contractors and the utility company to protect existing utilities and avoid disruption of service. Repair damaged utilities.

E. Restore or repair to their existing condition all lawns, planting areas, curbs, paving, streets, and walks damaged by the work of this Division.

F. Coordinate the timing of excavation and backfilling with the work of other Contractors.

G. Protect plant life, lawns, and other features remaining as a portion of final landscaping. Coordinate with General Trades Contractor.

H. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

I. In general, conform to the requirements of Division 2, except as specifically modified in this Section.

1.02 EXCAVATION SAFETY

A. The Contractor has the responsibility to comply with all governing Codes and Ordinances regarding safety of open excavations. This responsibility includes the use of all sheet piling, bracing, shoring, sheathing, warning lights, barricades, etc., that may be required. Such material will remain the Contractor's property upon completion of the work.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Granular Material: Material shall consist of natural or synthetic mineral aggregate such as broken or crushed rock, gravel, or sand; graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
2 1/2 inches	100
1 inch	70 to 100
No. 4	25 to 100
No. 40	5 to 50
No. 200	0 to 10

ODOT #310.

B. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
1. Minimum Size: 1/4 inch.
2. Maximum Size: 5/8 inch.

C. Sand: Natural river or bank sand; washed: free of silt, clay, loam, friable or soluble materials, or organic matter graded in accordance with ANSI/ASTM C136, within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Subsoil: Reused, select onsite or borrow soil materials conforming to the following:
1. ASTM D2487 Soil Classification Groups GW, GC, GM, SW, SC, SM, CL, and ML.
2. Less than 3% organic material by weight.
3. Free of unstable or unsuitable material or construction debris.

E. Coarse Material: Coarse aggregate, washed gravel, carbonate stone, graded within the following limits.

Sieve Size	Percent Passing
1 1/2 inches	100
1 inch	95 to 100
1/2 inch	25 to 60
No. 4	0 to 10
No. 8	0 to 5

ODOT #57

F. Concrete: Structural concrete conforming to Section 03 30 00 with a compressive strength of 1500 psi.

G. Drainage Fill: #8 Stone – ODOT #703.

Crushed Stone or Crushed Gravel: The aggregate shall be crushed carbonate stone or crushed gravel, graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Total Percent Passing
2 inch (50 mm)	100
1 inch (25.0 mm)	70-100
3/4 inch (19.0 mm)	50-90
No. 4 (4.75 mm)	30-60
No. 30 (600 µm)	9-33
No. 200 (75 µm)	0-13

Prior to placing, aggregate shall have a reasonably uniform moisture content at or near optimum for compaction.

ODOT #304

2.02 BEDDING AND BACKFILL

A. Bedding Materials:
1. Pea Gravel
2. Sand

B. Backfill Materials:
1. Below Floor Slabs: Coarse Material (ODOT #57), Drainage Fill (ODOT #73), Pea Gravel, Crushed Stone or Gravel (ODOT #304) and Granular Material (ODOT #310) compacted to 100% standard Proctor Density (ASTM D698-91).
2. Below Asphalt, Concrete or Plazas: Crushed Stone or Gravel (ODOT #304) and Granular Material (ODOT #310) compacted to 98% standard Proctor density (ASTM D698-91).
3. Lawn Areas: Suitable native material compacted to 95% standard Proctor density (ASTM D698-91).

C. Prohibited Materials: Backfill may not contain large rocks (over 2 inches), building materials, masonry debris, cinders, rubbish, wood or other material subject to decay, or material prone to damage buried portions of the work. The use of grits for backfill is prohibited.

PART 3 EXECUTION

3.01 EXCAVATION

A. Excavations are to be open cuts from the surface. Undercuts are prohibited. The trench shall be excavated in alignment with the proposed pitch and grade of sewer. Cut depressions to accept the additional diameter at each piping joint or bell hub.

B. Maintain 5 feet clear between trench and parallel building footing. When parallel trenches are required to be deeper than the footing, maintain a clear distance at least 1 1/2 times the vertical distance below the bottom of the footing or 5 feet, whichever is greater.

C. Where necessary, keep excavations free of standing water by drainage or pumping.

D. Keep excavations free of frost by covering, heating, or both.

E. If soil at planned elevation is found unsuitable for support of sewers, manholes, mechanical equipment, and materials, make provisions for proper support, and Contract price will be adjusted accordingly.

F. To prevent surface water from draining into excavation, grade top perimeter of excavation.

G. Hand trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measure by volume.

I. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

J. Correct areas over excavated by error.

3.02 BACKFILL

A. Where unstable or wet soil in trench bottom requires over excavation to firm soil, and in areas of accidental undercutting, backfill to planned bottom elevation with crushed stone, tamped firmly in place.

B. Backfill only when exact locations of lines and equipment have been recorded and all tests and inspections have been completed.

C. Do not use fill that is frozen or place fill on frozen ground.

D. Allow and pay for compaction control testing by the Soils Engineer retained under Division 2.

E. During backfilling operation, install a continuous 6 inch wide vinyl plastic tape with printing identifying buried service, 12 inches below finished grade.

F. In trenches below footings or walls, provide cast iron sleeve one pipe size larger (minimum) than pipe and concrete encasement for full width and 12 inches above top of pipe, extending 1 foot beyond each edge of footing or walls.

G. Where top of pipe is within 24 inches of driving or parking surface, provide concrete encasement in pipe trenches. Top of encasement to be minimum 12 inches above top of pipe.

H. For all lines below slabs on grade within building, all sanitary and storm lines outside building, all lines accidentally or intentionally undercut, and in other locations as may be required by governing Codes (except where concrete encasement is required), provide pipe bedding of pea gravel or course sand, 4 inches below pipe and 12 inches above pipe.

I. Compact the soil in 6 inch layers. Mechanical compaction of the first layer above the pipe by vibration or tamping devices should be done with caution.

J. To impede natural flow of groundwater, provide clay bulkheads (of native materials), minimum 3 feet long, across full width of pipe trenches at 100 foot intervals. Extend bulkheads to 12 inches above top of pipe.

K. Provide washed gravel backfill in trenches containing concrete encased underground ducts. Top of gravel 6 inches minimum above top of duct.

L. Provide manufacturer recommended backfill around underground sumps, interceptors, meter pits, catch basins, and tanks.

END OF SECTION

SECTION 20 05 30
CONCRETE BASES AND SUPPORTS

PART 1 GENERAL

1.01 CONCRETE WORK

A. Provide all concrete bases required for equipment supplied under this Division. Coordinate all pertinent dimensions, details, and cast-in-place items with the equipment being supplied.

B. All other concrete work incidental to the work of this Division is the responsibility of this Division's Contractor. Conform to the quality standards in Division 3. Such concrete includes but is not limited to:
   1. Backfill in trenches, where required to be concrete
   2. Pipe or duct encasement, thrust blocks, and similar concealed work

C. Do not mount equipment on concrete supports until concrete has had sufficient setting time (seven (7) days minimum).

1.02 SUPPORT STEEL

A. In general, all hangers, concrete anchor bolts, brackets, and other steel supports incidental to the work of this Division are to be provided by this Division's Contractor. Conform to the quality standards in Division 5. Only major support framing shown on the structural Drawings is to be provided by the others. For the proper execution of this work, provide all pertinent dimensions, details, and weights to those others.

PART 2 EXECUTION

2.01 INSTALLATION

A. Install thrust blocks at least 72 hours before testing the water lines.

END OF SECTION

SECTION 20 05 35
SLEEVES, SEALS AND FIRESTOPS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish sleeves for pipe and duct penetrations through precast concrete, masonry, and concrete construction or where piping or ductwork passes through floors, and equipment room floors.

B. Provide watertight as specified herein.

C. Use sleeving with absolutely watertight seal for piping passing through all foundation walls, floor slabs on grade, other below grade penetrations into building and elevated mechanical room floors.

D. Provide dimensions and locations of openings for sleeves, piping, ducts, louvers, grilles, and similar items to the Contractor requiring the information.

E. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation.

F. At no additional cost to the Owner, correct unacceptable seals, and provide additional inspection as necessary to verify compliance with this Specification.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 20 05 15, "Submittals":
   1. Manufacturer's product data sheets indicating product characteristics, performance, and limiting criteria.
   2. Manufacturer's installation instruction for each type of seal required by the project.

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal.

1.03 MANUFACTURERS

A. Seals:
   1. "Link-Seal" by Thunderline Corporation
   2. CSD Sealing Systems
   3. Calpico
   4. Wayne
   5. Michigan
   6. Metraflex

PART 2 PRODUCTS

2.01 SLEEVE MATERIAL

A. For sleeves less than 8 inches in diameter, use machine cut, standard weight, black steel pipe. Fabricate sleeves 8 inches in diameter and larger from 12 gauge galvanized steel sheet.

B. Use copper sleeves for bare copper piping.

C. Sleeves to be large enough for insulation to be continuous or for seals to be installed, but clearance all around to be less than 1/4 inch for both insulated and uninsulated pipes that penetrate walls and slabs.

D. Proset system prefabricated fire-rated sleeves may be installed as an option for poured-in-place concrete or through cored holes in floors or masonry walls.

E. Provide with waterstop anchor flange at midpoint where penetrating below grade floor slab or exterior structure at or below grade. Sleeves shall have a full-length welded intermediate flange and be imbedded in masonry. The Contractor may provide steel wall sleeves by Link-Seal or Proset Systems Prefabricated Sleeve System.

2.02 SEALS

A. Modular Mechanical Type:
1. Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between conduit and sleeve.
2. Seal assembly shall have steel bolts and nuts and rubber sealing element for service and environment under which assembly will be used. Seal shall have a pressure resistance rating of 20 psig.

B. Sealing Plug Type:
1. Seals shall consist of two (2) identical piece plugs made of synthetic rubber with one edge flanged, serrated profile on the outside, and on the inside a series of ridges that compress and assure a tight seal. Seal shall have a pressure resistance of 15 psig at the plug base and 30 psig at the flange. Rubber grade shall be suitable for the service and environment under which sealing plug will be used.

2.03 WATERTIGHT SEALS

A. Modular, mechanical-type watertight seals shall have zinc galvanized bolts and nuts with EPDM rubber sealing element. Seals shall be Link-Seal, Type C.

B. Sealing-plug-type watertight seals shall be made of EPDM rubber. Seals shall be by CSD Sealing Systems. OPTION: Proset System Elastomeric Seals.

PART 3 EXECUTION

3.01 CUTTING

A. Cut sleeves through walls flush with each surface. Unused sleeves shall extend beyond wall surface and be capped on each end.

B. Cut sleeves 3/4 inch above finished floors or concrete curbs and 4 inches above floors in equipment rooms, rooms with floor drains, and shafts. Sleeves through waterproof floors shall project a minimum of 4 inches above the floor. Cut bottom of sleeve flush with bottom of floor.

C. Core drill holes for sleeves in existing construction.

D. Patching shall be by others at this Contractor's expense.

3.02 INSTALLATION OF SLEEVES

A. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation. Install cast-in-place sleeves subject to the following limitations:
1. Do not embed aluminum without prior approval of coating material.
2. Do not displace reinforcing steel.
3. Maintain a center-to-center spacing of at least 3 diameters of sleeve.
4. Do not install sleeves in any concrete beam, unless specifically shown on the structural Drawings.

B. Give other Contractors as appropriate locations and sizes of all openings required for sleeve installation before construction of masonry or concrete walls and floors is started. If it is necessary to cut into the new work of other Trades due to the failure of this Contractor to provide proper notification, the other Trades shall do the cutting in at this Contractor's expense. Patching shall be done in the same fashion.

C. Core drill hole for sleeves in existing construction after locations have been approved by the Structural Engineer and General Contractor.

D. Size sleeves with 1/4 inch minimum and 1 inch maximum clearance all around pipe or pipe insulation.

E. Piping is not to bear on sleeves. Install sleeves plumb with respect to wall.

F. Minimize gaps between sleeve and ducts and pipes passing through walls and floors. Seal space up to a 1/2 inch gap with sealant or caulking. Close off space greater than 1/2 inch gap with sheet metal and seal airtight. To maintain fire rating of structure, pack all fire-rated separation sleeves with fire retardant or other noncombustible material. To fill space around all sleeves leading into exposed areas, use material compatible with adjacent construction and finish.

G. Plug, pack, and finish unused sleeves to match adjacent surface and be compatible with their ratings.

H. Provide chrome plated wall or floor escutcheons, sized to cover opening and seal, for all exposed conduit, piping and duct installations.

3.03 INSTALLATION OF SEALS

A. Clean surfaces and substrates of dirt, oil, loose materials, and other foreign materials that may affect the proper bond or installation of seals and firestopping.

B. Do not apply seals to surfaces previously painted or treated with a sealer curing compound or similar product. Remove coatings as required in compliance with manufacturer's instructions. Provide primers, as required, that conform to manufacturer's recommendations for various substrates and conditions.

C. Follow manufacturer's written instructions for installation of seals.

D. Install watertight seals for all below grade penetrations of piping into the building.

3.04 INSPECTION

A. Examine seals to ensure proper installation and full compliance with this Specification. Work shall be accessible until inspection and approval by the applicable Code authorities.

B. At no additional cost to the Owner, correct unacceptable seals, and provide additional inspection to verify compliance with this Specification.

C. Maintain a current, legible copy of the manufacturer's written instructions for installation of seals and firestopping at the project site, for all products being used on the Project. Make installation instructions available on request for all Inspecting Authorities, the Architect, and the Engineer.

END OF SECTION

SECTION 20 05 40
PIPING EXPANSION, NOISE AND VIBRATION ISOLATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Isolate all piping for both noise and vibration transmission.

B. Provide flexible connectors on all piping to equipment 5 hp and larger and where shown on equipment of lower horsepower.

1.02 MANUFACTURERS

A. Metraflex Company, Flexible Metal Hose, Wheatley, Proco, Mason Industries, or General Rubber.

PART 2 PRODUCTS

2.01 PUMP CONNECTORS (HYDRONIC SYSTEMS)

A. 1 1/2 Inch and Smaller: Metraflex SST, 250 degrees F, 400 psig, Type 321 stainless steel corrugated inner tubing and outer wire braid shield, threaded ends.

B. 2 Inches and Larger: Metraflex "Metraflex Style R" or "Cablesphere", 150 psig rating at concurrent 200 degrees F, EDPM and nylon molded globe, bias-ply tire cord reinforcing, cadmium-plated 150 ASA steel companion flanges. Provide restraining cables or rods to limit axial growth.

2.02 EXPANSION JOINTS

A. Stainless steel bellows and elements, cast iron equalizing rings, tie-rods and pipe connections as required, 300 psig working pressure. Use packless, internally guided type for lines 2 inches and smaller. Provide internal liner for steam systems. Metraflex Model MC.

2.03 FLEXIBLE CONNECTORS

A. Flexible rubber connector, 22 degrees F, 150 psig, 150 lb. ASA flanges, steel retaining ring.

2.04 PIPE ALIGNMENT GUIDES

A. All heating hot water and low-pressure steam lines shall be guided by a painted steel cylinder guide assembly with welded mounting brackets and two piece pipe clamp "Spider" assembly.

B. All high-pressure steam lines shall be supported on painted steel "T-pipe" guided slides, welded to pipe and base plate welded to support steel. Pipe slide and slide plate both to have factory bonded PTFE coating. Size units to conform with manufacturer's ratings for elevated temperatures. Typical support shall allow movement in axial direction only (PHD Fig. 690, Type 3 or approved equal). Within 12 feet of bends (or as indicated on the Drawings), support shall be allowed for horizontal movement in any direction (PHD Fig. 690, Type 6 or equivalent).

C. Provide galvanized steel U bolts (PHD Fig. 91 or equivalent) nutted firmly in place for alignment, with insulation guard and shield on heating hot water, low-pressure steam, condensate, condensate pump discharge, and chilled-water systems, installed on stands or racks.

PART 3 EXECUTION

3.01 INSTALLATION

A. Line Expansion:
1. U Bends: In all piping subject to expansion and contraction, install U Bends or loops in piping, in accordance with ASHRAE Equipment Handbook.
2. Expansion Joints: Where space is insufficient to provide U Bends, or where specifically shown or specified, provide expansion joints. Install according to the manufacturer's instructions.

B. Branch Connections:
1. Make branch connections to mains with a minimum of two (2) 90 degree elbows, and incorporate at least one (1) change of direction in the horizontal plane and one (1) change of direction in the vertical plane before connecting to equipment or fixtures, or dropping into or rising in a wall.
2. Bullhead connections in any piping services are expressly prohibited.

C. Guides: To preserve alignment and pitch, supplement all loops and expansion joints with adequate guides as close to loops and joints as possible and additionally at recommended intervals from joints. Rigidly secure guides to the structure and ensure that only axial movement is permitted. Provide auxiliary support metal as required to secure guides to structure. Follow the recommendations and guidelines of the Expansion Joint Manufacturer's Association, Inc.

D. Anchors: Install pipe anchors where required to secure the pipe and totally eliminate movement. Attach the anchors securely to the structure.

E. Pump Connectors: Install pump connectors according to the manufacturer's recommendations and instructions. Do not use pump connectors to align pump connections with piping. Install connectors with as little initial misalignment or deflection as possible.

END OF SECTION

SECTION 20 05 45
HANGERS, SUPPORTS AND INSERTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide hangers, supports, concrete inserts, threaded rods, framing steel, and hardware required for piping, ductwork, and equipment installed under this Division.

B. Install all necessary inserts, expansion shields, beam clamps, floor supports, and auxiliary steel.

C. For new concrete installations, furnish and install concrete inserts (when used or required) for the work. Coordinate with other Contractors as appropriate.

D. So as not to delay construction, the Plumbing, Fire Protection, and HVAC Contractors are responsible for correct locations, size, type, and installation of the concrete inserts for their work. Coordinate work with other Contractors as appropriate.

E. Install wall brackets where required.

F. Support piping at equipment from floor, structure or walls, so that piping weight is not supported by equipment. Install hangers with vibration isolator on all piping, ductwork, and equipment support in the room's housing mechanical equipment. See Section 20 05 80, "Vibration Isolators."

1.02 QUALITY ASSURANCE

A. All piping supports and parts shall conform to the latest requirements of the Code for Power Piping (ANSI B31.1) and MSS Standard Practice SP-58 and SP-69, except as supplemented or modified by the requirements of this Specification.

B. Components shall be selected and matched to the load imposed on them.

C. For ductwork supports, refer to SMACNA's "HVAC Duct Construction Standards Metal and Flexible" (latest edition).

D. Items specified in this Section that are used for fire suppression systems shall be UL listed, FM approved and NFPA approved for the usage.

1.03 MANUFACTURERS

A. Pipe Hangers: PHD, PHP, Michigan Hanger (Erico), Hilti, Kinetics, B-Line, Anvil, or Modern.

PART 2 PRODUCTS

2.01 HANGERS

A. Uninsulated Piping:
   1. Steel or Plastic:
      a. 1/2 Inch to 6 Inches: PHD Fig. 151, adjustable swivel ring, steel band, adjusting nut or Fig. 450 adjustable clevis, carbon steel yoke, U-strap, bolt and hex nuts.
   2. Copper:
      a. Use copper-plated hangers as specified previously for sizes up to 6 inches.

B. Insulated Piping:
   1. Cast Iron (Storm), Steel, Plastic or Copper:
      a. All piping except steam and hot water piping, all sizes: PHD Fig. 450, adjustable clevis, carbon steel yoke, U-strap, bolt, and hex nuts. Provide thermal protector.
      b. Hot Water Piping:
         1) 1/2 Inch to 1 1/2 Inches: PHD Fig. 450, adjustable clevis, carbon steel yoke, U-strap, bolt, and hex nuts. Provide thermal protector.
      c. Hanger size must be sufficient to accommodate pipe and insulation without compressing insulation.
   2. Thermal Protector:
      a. Insulated saddle system consisting of a factory-assembled glass-reinforced polypropylene saddle and steel pipe spacer. Assembly conductivity must be less than 0.77 btuh-in./sf-hr°F, and shall be rated for at least 40 degrees F to 200 degrees F service. Anvil Figure 260 ISS, or equal by approved manufacturer.
      b. 6 inch long segments of 20 pcf molded fiberglass blocks Hamfab "H-block" or hardwood (oak) blocks supported by PHD Fig. 170, galvanized steel protection shield. Outdoor installations to be hardwood inserts, paraffin-coated. No softwood (pine) wood blocks or wooden dowels will be permitted. Provide a vapor barrier cover over inserts so that the insulation vapor barrier will not be broken.

C. Sanitary and Vent Piping:
   1. Cast Iron: PHD Fig. 450, adjustable clevis, carbon steel yoke, U-strap, bolt, and hex nuts.
   2. Plastic: PHD Fig. 440, lightweight, adjustable clevis, carbon steel yoke, U-strap and bolt.

D. Vertical Piping:
   1. Cast Iron, Plastic, or Steel Piping:
      a. 1/2 Inch to 10 Inches: Friction clamp with two point bearing, PHD Fig. 550 series at each floor level.
   2. Copper Piping: Copper-plated friction clamp with two point bearing for sizes up to 6 inches, PHD Fig. 552.

2.02 SPRING HANGERS

A. Refer to Section 20 05 80, "Vibration Isolators."

2.03 TRAPEZE HANGERS

A. Pre-engineered strut or angle iron of sufficient length to support pipes and insulation on individual hangers, roller supports, or saddles with insulation protectors as specified for hangers above; trapeze hanger rod diameter and quantity as required to support total piping load. Loading on any attachment point to the structure shall not exceed 1,000 lbs. Trapeze hangers are to be spaced to not exceed this maximum structural load.

2.04 SUPPORTS

A. Hanger for Individual Pipes:

Pipe Size	Max Pipe Support Spacing Copper Tube or Plastic Pipe	Max Pipe Support Spacing Steel Pipe	Structural Attachment Based on PHD Manufacturer	PHD Hanger Figure	Rod Size based on Hanger (Larger rods may be used)
Inches	Feet	Feet			Inch
3/4 or smaller	5 - copper 3 - plastic	6	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450	3/8
1	6 - copper 3 - plastic	7	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450	3/8
1 1/4	6 - copper 4 - plastic	9	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450	3/8
1 1/2	8 - copper 4 - plastic	9	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450	3/8
2	8 - copper 4 - plastic	10	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450 or 470 or 475	3/8
2 1/2	9 - copper 4 - plastic	10	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450 or 470 or 475	1/2
3	10 - copper 4 - plastic	10	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	151 or 450 or 470 or 475	1/2
4	10 - copper 4 - plastic	10	Concrete attachment plate Fig 903 Beam clamp fig 350 w/Fig 359 or Fig 360 w/Fig 359	151 or 450 or 470 or 475 or 505	5/8
5	10 - copper 4 - plastic	10	Concrete attachment plate Fig 903 Beam clamp fig 350 w/Fig 359 or Fig 360 w/Fig 359	151 or 450 or 470 or 475 or 505	5/8 or 3/4
6	10 - copper 4 - plastic	10	Concrete attachment plate Fig 903 Beam clamp fig 350 w/Fig 359 or Fig 360 w/Fig 359	151 or 450 or 470 or 475 or 505	5/8 or 3/4

For fire sprinkler systems, conform to latest NFPA standards required by OBC.

B. Beam Clamps:
   1. "C" Clamps: PHD Figs. 270 w/259, 350 w/359, 360 w/359, malleable iron body, steel pointed set screw with lock nut and a minimum of 11 gauge steel retainer strap. Beam clamps by themselves (C-clamps) are expressly prohibited. Provide retainer straps with all beam (C-Clamps). Consult with MSS SP-58 and SP-69 for C-Clamp identification.
   2. PHD Fig. 930 steel washer plate, double nutted with threaded rod.

C. Wall Brackets: PHD Fig. 850 (lightweight 750 lbs. load) or Fig. 855 (medium weight 1,500 lb. load), carbon steel, back plates and bolts. Wall brackets for horizontal piping runs are limited to 10 inch pipe size and smaller.

D. Hanger Rod on Wood Beams or Trusses: PHD Fig. 50 unwelded eye rods or PHD Fig. 55 welded eye rods with washer and lag bolt. Install lag bolt through entire beam or truss when load exceeds manufacturer's recommended load for lag bolt application. Piping loads on wood structures shall be limited to 600 lbs.

E. Attachment to Concrete Structures: PHD, Fig. 903 concrete rod attachment plate.

F. Welded Beam Attachment: PHD, Fig. 900 concrete rod attachment plate.

2.05 INSERTS

A. In Concrete: PHD, Fig. 950 wedge type insert, low carbon steel, for up to 600 lb. load.

B. In precast or already poured concrete: Hilti "Kwik Bolt TZ" concrete fasteners, or approved equal by ITW/Redhead. "Drop-in" type fasteners are not acceptable without written evidence of third-party testing indicating there is no measurable loss of an insert's tensile capacity when concrete cracking occurs where the insert is installed.

2.06 FINISH

A. Unless otherwise noted, all hangers and supports to be standard black, except that hangers and supports for exposed exterior applications and applications subject to high humidity shall be hot-dipped galvanized.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Install necessary pipe hangers and supports to properly support all piping and to maintain piping uniformly level or vertical (3/4 inch maximum deflection). Hangers to be double-nutted.

B. Maximum spacing of piping supports shall be per Hanger Table included in this Specification. Provide additional hangers as follows:
   1. Horizontal DWV Plastic Piping: At branch connections and at each change of direction.
   2. Vertical DWV Piping: At branch connections, at each change of direction, at each floor, and mid-story, for no more than a 10 foot vertical spacing. Provide additional supports as necessary to maintain piping alignment at the base.

3. Cast Iron Piping: Horizontal at intervals not in excess of the standard lengths of pipe used; vertical 15 foot maximum intervals, at base, and at each floor.
4. Fire Protection Piping: Locate and space per NFPA requirements.

3.02 DUCTWORK HANGER INSTALLATION

A. Install necessary hanger rods and angle iron support brackets to properly support ductwork, insulation, reinforcing, and external loads. Friction clamps are excluded as upper attachment devices.

B. Maximum spacing of supports to be as follows:

Rectangular Ducts

1/2 x Duct Perimeter (Inches)	Rod Diameter (Inches)	Spacing (Feet)
Less than 72	3/8	10
72 to 120	3/8	8
120 to 192	1/2	5

Round Ducts

Duct Diameter (Inches)	Rod Diameter (Inches)	Spacing (Feet)
Through 24	1/4	12
25 through 36	3/8	12
37 through 50	1/2	12

1. Use a pair of rods, one (1) on each side of ductwork. Rods to be uncoated, hot-rolled steel.
2. OPTION: 1 inch wide sheet metal straps may be used on sizes up to 22 inches wide (or 22 inches in diameter), one (1) sheet metal gauge (minimum) thicker than ductwork being supported.
3. OPTION: Looped, flexible cable hanger system (Gripple Standard Hanger type) may be used on solid round duct up to 16”. Installation shall comply with manufacturer recommendations for weight and spacing.

3.03 GENERAL INSTALLATION

A. Ceiling grid system shall not be used to support ductwork, electrical conduit, refrigerant or plumbing lines, or any other utility lines. Each utility and the ceiling grid system shall be a separate installation and each shall be independently supported from the building structure. To support ductwork or piping where interferences occur, the Contractor must install trapeze type hangers or supports that shall be located where they do not interfere with access to fire dampers, valves, and other mechanical equipment items.

B. Where necessary, the Contractor shall furnish and install proper angles or channels for hanger supports between joists. Weld to steel structural members.

C. Do not support hangers from roof deck.

D. Use inserts to avoid cutting concrete or masonry. To avoid burning metal deck, use top flange beam clips.

E. Vertical storm and waste stacks to rest firmly on masonry footings and be firmly supported at each floor.

F. The following hanger methods are not permitted:
   1. Wood, lead, or plastic plugs
   2. Perforated band iron
   3. Hook chain supports
   4. Baling wire, etc.
   5. Powder-actuated anchors

G. Whenever possible, use supports, clamps, hangers, etc., designed especially for the equipment to be installed.

H. Where necessary, furnish and install proper angles or channels or support steel to reinforce the building structure or to spread out the load on the building structure. Weld to steel structural members or attach to concrete structures using inserts or concrete fasteners.

3.04 COORDINATION

A. Coordinate drilling, welding, etc., and method of attachment to columns, joists, beams, girts, etc., with Structural Engineer and other Contractors as appropriate before proceeding.

END OF SECTION

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

Hangers for Individual Pipes (Not SEISMIC)

Pipe Size	Pipe Material	Weight of Pipe per Foot	Weight of Water in Pipe per Foot	Total Weight per Foot	Pipe Support Spacing Copper and plastic Pipe	Pipe Support Spacing Steel Pipe	Weight on Each Support (Max 1500 lbs)	Structural Attachment Based on PHD Manufacturing.	Load Capacity of Attachment	Hanger PHD Fig Number	Rod Size based on Hanger (Larger rods may be used)	Load Capacity of Hanger and Rod
inches		lbs/LF	lbs/LF	lbs/LF	ft	ft	lbs		lbs		inch	lbs
3/4 or smaller	Sch 40 Steel	1.13	0.232	1.362	5	7	9.53	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450	3/8	300
1	Sch 40 Steel	1.68	0.375	2.055	6	7	14.39	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450	3/8	300
1-1/4	Sch 40 Steel	2.27	0.649	2.919	7	9	26.27	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450	3/8	300
1-1/2	Sch 40 Steel	2.72	0.882	3.602	8	9	32.42	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450	3/8	300
2	Sch 40 Steel	3.65	1.454	5.104	8	10	51.04	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450 or 470 or 475	3/8	150
2-1/2	Sch 40 Steel	5.79	2.073	7.863	9	11	86.49	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450 or 470 or 475	1/2	225
3	Sch 40 Steel	7.58	3.201	10.781	10	12	129.37	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450 or 470 or475 or 505	1/2	310
3-1/2	Sch 40 Steel	9.11	4.287	13.397	12	12	160.76	Concrete insert Fig 951 or 950 Beam Clamp Fig 270 w/Fig 259	400	151 or 450 or 470 or 475 or 505	1/2	390
4	Sch 40 Steel	10.79	5.516	16.306	12	12	195.67	Concrete Attachment plate Fig 903 Beam Clamp Fig 350 w/Fig359 or Ffig 360 w/Fig 359	600	151 or 450 or 470 or 475 or 505	5/8	475
5	Sch 40 Steel	14.62	8.674	23.294	12	12	279.53	Concrete Attachment plate Fig 903 Beam Clamp Fig 350 w/Fig359 or Ffig 360 w/Fig 359	800	151 or 450 or 470 or 475 or 505	5/8 or 3/4	685
6	Sch 40 Steel	18.97	12.520	31.490	12	12	377.88	Concrete Attachment plate Fig 903 Beam Clamp Fig 350 w/Fig359 or Ffig 360 w/Fig 359	2710	151 or 450 or 470 or 475 or 505	5/8 or 3/4	780
8	Sch 40 Steel	28.55	21.680	50.230	12	12	602.76	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	3770	151 or 450 or 470 or 475 or 505	7/8	780
10	Sch 40 Steel	40.48	34.160	74.640	12	12	895.68	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	3770	450 or 470 or 475	7/8	965
12	Sch 40 Steel	53.52	48.500	102.02	12	10	1020.20	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	3770	450 or 470 or 475	7/8	1200

Hangers for Individual Pipes (Not SEISMIC)

Pipe Size	Pipe Material	Weight of Pipe per Foot	Weight of Water in Pipe per Foot	Total Weight per Foot	Pipe Support Spacing Copper and plastic Pipe	Pipe Support Spacing Steel Pipe	Weight on Each Support (Max 1500 lbs)	Structural Attachment Based on PHD Manufacturing.	Load Capacity of Attach -ment	Hanger PHD Fig Number	Rod Size based on Hanger (Larger rods may be used)	Load Capacity of Hanger and Rod
inches		lbs/LF	lbs/LF	lbs/LF	ft	ft	lbs		lbs		inch	lbs
14	Sch 40 Steel	63.44	58.640	122.08	12	9	1098.72	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	4960	450 or 470 or 475	1	1200
16	Sch 40 Steel	82.77	76.580	159.36	12	7	1115.45	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	4960	450 or 470 or 475	1	1200
18	Sch 40 Steel	104.67	96.930	102.6	8	6	1209.60	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	6230	450 or 470 or 475	1 or 1-1/8	1400
20	Sch 40 Steel	123.11	120.46	243.57	8	6	1461.42	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	8000	450 or 470 or 475	1-1/4	1600
24	Sch 40 Steel	171.29	174.23	345.52		4	1382.08	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	8000	450 or 470 or 475	1-1/4 or 1-1/2	1600
30	Sch 30 Steel	196.08	281.4	477.48		8	3819.84	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	8000	450 or 480	1-1/4 or 1-1/2	6000
36	Sch 40 Steel	282.35	405.24	687.59		8	5500.72	Concrete Attachment plate Fig 903 Beam Welded Attachment Fig 900	11630	450	1-1/2	9500

SECTION 20 05 50
GENERAL PIPING REQUIREMENTS

PART 1 GENERAL

1.01 PIPING SYSTEMS - GENERAL

A. The following instructions apply to all piping systems, except where otherwise noted:
   1. Provide unions or flanges / Provide unions, flanges, or grooved ends at each final connection and at each piece of equipment. Arrange piping and locate unions and flanges / unions, flanges, and grooved ends to permit easy removal of parts and equipment for inspection and cleaning. Welded connections to equipment are prohibited.
   2. Make connections to equipment as detailed on the Drawings and according to the manufacturer's installation instructions.
   3. Where connection size is smaller than piping make reduction at final connection only (do not reduce size of pipe drop).
   4. Provide valves and specialties as required to complete installation of each piece of equipment for proper operation.
   5. Install all piping parallel to building lines, level and plumb unless required to slope.

B. Cleanout and flush water piping systems.

C. If other means of draining are not provided, install drain valves at all low points to permit complete draining of each of the following:
   1. All water systems
   2. Fire sprinkler systems (according to NFPA)

D. Contractor to provide information on chases, sleeves, and openings required for his/her work to other Contractors. This Contractor to assume cost and responsibility for all cutting and patching resulting from improper coordination of the work.

E. Certified Pipe Welding Bureau. Welds to be stamped at each joint or fitting.

F. Install dielectric unions at all connections of dissimilar metals.

PART 2 PRODUCTS

2.01 UNIONS

A. Unions in Copper Pipe: Bronze 150 lb. ground joint, cast body, solder end (do not use wrought copper unions). Mueller, Chase, Crane, or Northern Indiana Brass Company.

B. Unions in Steel Pipe: Black malleable iron, bronze ground ball joint. Mueller, Chase, Crane, or Northern Indiana Brass Company.

C. Dielectric unions when connecting steel to copper pipe: 250 lb. W.P., insulating gasket, and dielectric insulators. Epco, Dart, Capital, or Watts.

D. Dielectric fittings on flanges when connecting flanges on piping of dissimilar metals: 175 psig W.P., insulating gaskets, dielectric insulators including bolt isolators.

2.02 JOINTS

A. Flanges:
   1. Through 2 1/2 Inches: Cast iron screwed, 125 lb. or higher as required.
   2. 3 Inches and Larger: Steel welding neck, 150 lb. or higher as required.

B. Gaskets: Asbestos-free, suitable for the intended service. Use dielectric gaskets where joining dissimilar piping material.

C. Bolts for steel, cast iron, brass, and bronze, for 250 lb. SWP and 450 degrees F or below to be carbon steel, with American Standard, regular, square heads and American Standard, heavy, hexagon grade or better semi-finished nuts.

D. ASTM A307, Grade B, Tee head, high-tensile steel bolts and nuts may be used in mechanical joint pipelines. (Mechanical joints are not to be used with tubing of copper or aluminum alloys.)

E. Screwed Piping: Use NPT tapered threads.

2.03 GROOVED PIPING

A. Where grooved piping systems are allowed by reference in other Sections within this Specification, the installing Contractor must have installed at least five (5) grooved mechanical piping systems.

B. Install grooved couplings on 2 inch – 24 inch roll-grooved, standard weight Schedule 40 pipe in accordance with the coupling manufacturer's installation instructions. Cut-grooved piping systems will be unacceptable.

C. Install flexible couplings with the bolt pads metal to metal; rigid (slant bolt pad) couplings shall be installed within the bolt pads metal to metal with equal offset. Installing Contractor shall verify that bolt pad gaps do not exist.

D. The grooved mechanical coupling manufacturer shall perform on-site installation demonstrations for the Installing Contractor before grooved coupling installation begins.

2.04 COPPER PRESS JOINT JOINING SYSTEM

A. Where such copper press joint piping systems are allowed by reference in other Sections within this Specification, and if permitted by local authorities, the installing Contractor must have installed at least five of such mechanical piping systems.
   1. Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

2. All piping shall be Type "L" copper. Fittings 1/2 inch to 4 inches shall be crimped on both sides of an integral bead containing an EPDM seal. Fittings 2 1/2 inches through 4 inches shall be double crimped, and be fitted with a stainless steel grip ring.
3. The Contractor shall be trained on the installation of the product by the manufacturer and shall follow the manufacturer's installation instructions.
4. The copper tubing system shall be water tested for joint tightness. The piping system shall be filled with water. The system shall be pressurized to the maximum pressure and length of time required by the code or standard. The system shall have no leaks at the rated pressure.
5. Valve joining method shall comply with requirements of Section 22 05 23, “Plumbing Valves” or 23 03 23, “HVAC Vales”. Valves using the Press Joint Joining System are not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install each union or flange to permit removal of parts, valves, and equipment and in a position permitting the device or equipment to be removed without disconnecting piping. Use flanged equipment connections exclusively on all steam and condensate systems.

B. Make reductions in piping lines with reducing coupling or weld fitting reducer. No bushings will be permitted.

C. Install piping to provide clearance for personnel passage, headroom, operation of doors or windows, equipment, lighting outlets, and for the Owner's apparatus and equipment. Coordinate pipe runs and elevations with other Contractors before installation. Where interferences develop in the field, pipes may need to be offset or rerouted, at no additional cost to the Owner, as required to resolve interferences.

D. In pipe spaces to be entered for servicing, offset piping so that all lateral runs are located either near the floor or at least 6 feet above the floor, and all vertical piping is held close to the wall through that height. Keep all piping to the side of the chase wherever possible. Offset vents immediately above the connection to the waste line.

E. Piping shall not be installed over electrical equipment, motor control centers, or transformers and shall not be installed within elevator shafts or elevator equipment rooms.

F. Install pipes, valves, fittings, etc. with a minimum of 1/2 inch clearance between the finished covering and other work and between the finished covering of parallel, adjacent pipes.

G. Use fittings to make changes in pipeline direction. Do not bend or spring piping.

H. Offset lines around columns, beams, and other obstructions as required. Where special conditions are encountered in the field, arrangement and alignment of piping shall be decided by the Architect and Engineer.

I. At time of assembly, clean piping components of loose material. After assembly and before putting in service, blow or flush lines free of loose materials. Clean strainer screens and sediment pockets prior to putting the lines in service.

J. Install valves at service connections to equipment and branch lines from main lines. Install all valves and unions so that they are accessible through ceiling or wall access panel.

K. Use dielectric unions, shims, gaskets, or coatings to insulate direct contact between pipe, fittings, and hangers of dissimilar metal

L. Install thermometers and gauges to permit them to be read from floor level.

M. Securely support all piping from structure with approved hangers, rods, brackets, and accessories.

N. Where piping is installed in new masonry block walls, coordinate other Contractors as appropriate so that piping extends out through a masonry joint where possible.

O. Bullhead connections are not allowed.

P. Where exposed pipes pass through walls, floors, or ceilings of finished rooms, provide chrome-plated escutcheons. Prime-coated black iron escutcheons may be used in unfinished rooms. Protect escutcheons from tool marks.

Q. Keep pipe level except where a slope is required. Use eccentric reducers to keep bottom of pipe level.

R. Avoid trapping of piping.

S. Install ball valves at pressure gauges and air vents at high points of piping.

T. Provide a union or bolted flange fitting downstream and within approximately 12 inches of each valve and adjacent to other equipment.

U. When copper lines are supplied, install dielectric unions or flanges on water line connections to water heaters and equipment with steel pipe connections.

V. Provide unions or flanged connections where required for construction or assembling purposes.

3.02 WELDED CONNECTIONS

A. Welded joints to be fabricated and stamped by welders qualified and certified for the positions, materials, methods, and equipment being used and as required by enforcing bodies.

B. Buttweld joints shall have substantially full penetration and recommended bead reinforcement.

C. Slip-on, socket, and fillet welds to have geometry indicated in the "Code for Power Piping" (ANSI B31.1).

D. Remove weld scale from joints as work proceeds and at completion.

3.03 SOLDERED AND BRAZED CONNECTIONS

A. Joints to have pipe or tubing end reamed to full I.D. after cutting.

B. Exterior of joint shall be smooth.

C. Clean with steel wool.

D. Apply flux to prevent oxidation.

E. Apply solder or brazing filler material and thoroughly heat to completely melt material and cause it to migrate completely over the mating surfaces.

F. Solder and brazing work shall comply with ANSI Standard B31.1.

G. Valve joining method shall comply with requirements of Section 22 05 23, “Plumbing Valves” or 23 03 23, “HVAC Vales”. The use of soldered or brazed joints on valves is not acceptable.

3.04 THREADED CONNECTIONS

A. Ream pipe ends of threads to full cross sectional area after cutting. Threads shall conform to ANSI Standard B2.1.

B. Joints shall be made with TFE tape, applied to male threads only. Option: Use Permatex pipe dope.

3.05 FLANGED CONNECTIONS

A. Face flanged joints square and true. Install gaskets suitable for the operating temperature and pressure of the fluid or gaseous medium being piped.

3.06 PIPE CLEANING

A. Before systems are placed in operation, flush out all water piping systems to remove dirt and grease from pipes and equipment. Clean strainers after each flushing until they remain clean.

B. Fire protection mains to be flushed at flows required by NFPA-13 and NFPA-24.

3.07 PIPING PROHIBITIONS

A. Do not run piping over electrical equipment, across windows, door openings, access panels or lighting fixtures or within 36 inches in front of electrical panels that operate at a voltage of 150 volts or less, or within 42 inches of electrical panels that operate at a voltage of 151 to 600 volts. Obtain instructions from the Architect if a conflict occurs. Coordinate with the Electrical Contractor.

B. On any given system, the Contractor will not be permitted to mix and join different types of pipe material. For example, if a storm or sanitary system uses plastic, copper, and cast iron, the Contractor may change from one to the other only once. The line may not be changed back to the first material further downstream.

C. Storm, vent and sanitary lines shall be continuously sloped; trapping is expressly prohibited.

3.08 EMBEDDED PIPING LIMITATIONS

A. Install embedded pipes and sleeves subject to the following limitations:
1. Do not embed aluminum without prior approval of coating material.
2. Do not displace reinforcing steel.
3. In slabs and walls, limit outside dimension of pipes to 1/3 member thickness. Minimize crossing embedded piping, and where crossing cannot be avoided, maintain same minimum concrete cover as required for reinforcing bars. For slabs over metal decks, slab thickness is measured from the top of the metal deck.
4. In columns, limit total area of pipes to 4% of column area.
5. Maintain a center-to-center spacing of at least three diameters of pipe or sleeve.
6. Do not install sleeves or piping in any concrete beam, unless specifically shown on the structural Drawings.

END OF SECTION

SECTION 20 05 55
VALVE TAGGING

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide valve tags on all HVAC, Plumbing, and Fire Protection valves including control valves. Stamp tags with service designation and number tags consecutively for each system. Coordinate numbering with any existing valve tag schedules and with the Owner.

B. Prepare a typewritten valve tag directory with charts showing locations, designations, and sizes of valves. Laminate under plastic and mount as directed by the Architect. Include additional copies of valve charts in the Service Manuals.

1.02 COORDINATION

A. Coordinate with all other Contractors to ensure that the valve tagging used by all Trades is uniform in type, style, and appearance.

1.03 MANUFACTURERS

A. Brady, Seton, Kolbi, EMED, MSI, or Brimar.

B. All valve tags used on the project shall be same type, shape, and lettering and be made by the same manufacturer. Coordinate with all other Contractors.

PART 2 PRODUCTS

2.01 TAGS

A. 2 inch diameter, 16 gauge, brass tag with brass chain. 1/4 inch high stamped letters over 1/2 inch high stamped numbers, both black-filled.

B. Furnish and install color-coded tags to indicate concealed valve locations. Attach color-coded tags to the ceiling T-bars. Match tag colors to the color of the pipe band specified.

2.02 IDENTIFICATION SCHEDULE

A. Identify as follows:

	Type of Service	Valve Tag Designation
PLUMBING	Domestic cold water	DCW
	Domestic hot water	DHW
	Tempered water	TW
	Domestic hot water return	DHWR

	Type of Service	Valve Tag Designation
FIRE PROTECTION	Fire and water service	FW
	Wet pipe sprinkler system	SPR
HVAC		
	Refrigerant suction	S
	Refrigerant liquid	L
	Refrigerant hot gas	HG
	Temperature control valves	(Varies)

PART 3 EXECUTION

3.01 INSTALLATION

A. Tags:
1. Attach to valve handwheels.
2. Locate to be easily readable from standing position when valve is in normal position.

END OF SECTION

SECTION 20 05 61
POWER FACTOR CORRECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide power factor corrective capacitors, switches, wiring, and all necessary accessories for complete installations as required under Section 20 05 10, "Coordination Between Trades."

B. UL compliance: Comply with UL 810, "Capacitors." Provide power factor corrective capacitors that are UL-listed and labeled.

C. Equipment furnished shall be standard products manufactured by Square D Company, General Electric, Cutler-Hammer/Eaton Corporation, Aerovox, Inc., or Sprague Electric Company.

PART 2 PRODUCTS

2.01 POWER FACTOR CORRECTION DEVICES

A. General: Provide power factor corrective capacitors and associated components complying with the manufacturer's standard materials, design, and construction; in accordance with published product information; and as required for complete installation, including hangers, brackets or other accessories. In sizing capacitors, take care to avoid excessive feedback harmonics.

B. Capacitors: Provide factory-assembled power factor corrective capacitors of types, sizes, ratings, and electrical characteristics indicated and capable of correcting power factor to 90% or greater. Construct of internally fused, individually replaceable unit cells enclosed in a protective enclosure. Provide capacitors with discharge resistors that reduce voltage to 50 volts or less within one (1) minute after capacitors are disconnected. Use welded heavy gauge steel to construct single-case housings that can be ganged for multiple-bank installation. Equip with solderless connecting terminal lugs. Provide with nonflammable impregnant for operating with ambient temperature ranges of -40 degrees F to 104 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. To ensure that power factor corrective capacitors fulfill requirements, install capacitors in accordance with the manufacturer's written instructions and with recognized industry practices. Comply with installation requirements of NEC pertaining to power factor corrective capacitors.

B. Coordinate with other electrical work as necessary to properly interface installation of capacitors with other work.

C. Grounding: Where required by the manufacturer, provide equipment grounding connections. For corrective capacitors, tighten sufficiently to assure a permanent and effective ground.

3.02 FIELD QUALITY CONTROL

A. After installing capacitors, energize capacitors and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise, remove units, replace with new units, and retest.

END OF SECTION

SECTION 20 05 65
EQUIPMENT, PIPING, AND DUCTWORK IDENTIFICATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Identify by labels and tags the following items:
   1. Equipment such as water heaters, air handlers, fan coils, condensers, control cabinets, and similar items.
   2. Piping and ductwork exposed in equipment rooms and accessible service areas.
   3. Piping and ductwork above accessible ceiling construction and near access panels in non-accessible ceiling construction.

B. Install laminated plastic nameplates for equipment, and install color banding, flow arrows, and contents identification for piping.

1.02 COORDINATION

A. Coordinate with other Contractors to ensure that the identification used by all Trades is uniform in type, style, and appearance.

B. Coordinate all identification systems with any already existing.

1.03 MANUFACTURERS

A. Brady, Seton, Kolbi, Graphic Products, CALPICO, EMED, MSI, or Brimar.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION

A. Engraved laminated plastic, white over black, sized for 3/4 inch high letters or numbers, Gothic style.

2.02 PIPING AND DUCTWORK IDENTIFICATION

A. Provide vinyl adhesive labels or vinyl wrap-around markers. Match label background color to 2 inch color band.

B. Size to be as follows:

Outside Diameter of Pipe or Covering	Minimum Letter Height
3/4" to 1-1/4"	1/2"
1-3/8" to 2"	3/4"
2-1/8" to 7-7/8"	1-1/4"

Outside Diameter of Pipe or Covering	Minimum Letter Height
8" to 10"	2-1/2"
Over 10"	3-1/2"

2.03 COLOR BANDS

A. Provide 2 inch wide (minimum) painted gloss enamel or vinyl tape color band on each pipe, completely wrapping the pipe circumference. See "Identification Schedule" for band color.

2.04 FLOW ARROWS

A. Provide color-coded adhesive vinyl flow arrow on each pipe, secure flow arrows to pipe at each end of flow arrow with a color band, completely wrapping the pipe circumference. Match flow arrow color with color band.

B. Size to be as follows:

Outside Diameter of Pipe or Covering	Minimum Flow Arrow Size
3/4" to 1-1/4"	1-1/8" by 4"
1-3/8" to 2"	1-1/2" by 4"
2-1/8" to 7-7/8"	2-1/4" by 6"
8" and over	4" by 7"

C. In lieu of separate flow arrows, flow arrows may be incorporated into color bands. See "Identification Schedule" for band color, and match flow arrow color lettering color.

2.05 IDENTIFICATION SCHEDULE

A. Identify as follows:

Type of Service	2 Inch Color Band and Label Color	Lettering Color	Designation
FIRE PROTECTION			
Sprinkler	Red	White	SPR
Drain	Red	White	D
PLUMBING			
Domestic cold water	Green	White	DCW
Domestic hot water (systems less than 140°F)	Yellow	Black	DHW
Domestic hot water return (systems less than 140°F)	Yellow	Black	DHWR
Tempered water	Yellow	Black	TW

Type of Service	2 Inch Color Band and Label Color	Lettering Color	Designation
Sanitary	Yellow	Black	SAN
Vent	Yellow	Black	V
HVAC			
Air conditioner condensate	Green	White	COND
Refrigerant hot gas	Yellow	Black	HG
Refrigerant liquid	Yellow	Black	L
Refrigerant suction	Yellow	Black	S
HVAC DUCTWORK			
Supply air	Blue	White	Supply
Return air	Blue	White	Return
Exhaust air	Yellow	Black	Exhaust
Relief air	Blue	White	Relief
Outside air	Blue	White	Outside Air

PART 3 EXECUTION

3.01 INSTALLATION

A. Attach equipment tags with screws. Exception where screws might damage equipment or ductwork, use compatible adhesive instead of screws.

B. Apply piping and ductwork identification only after finish painting is completed.

C. Provide service designations, flow arrow, and color banding at intervals of 15 feet (maximum).

D. Also identify piping at connections to equipment, at entrances to spaces, at valves, near access doors to pipe spaces, at branches from main, at each riser, and at both sides of the wall or barrier through which the piping passes.

E. Clean piping, duct, or insulation in area of labeling just before labeling of pipe, duct, or insulation.

F. Ensure that labels are readable from a normal standing position.

END OF SECTION

SECTION 20 05 75
ACCESS PANELS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish access panels necessary for access to mechanical equipment, valves, shock absorbers, or other devices requiring service, adjustment, or maintenance as follows:
   1. Ceiling
   2. Wall
   3. Ductwork

B. All access panels shall be 24 inches by 24 inches unless otherwise noted.

1.02 WORK NOT INCLUDED

A. Access panels are to be turned over to other Contractors as appropriate for installation.

1.03 COORDINATION

A. This Contractor is responsible for providing the dimension and locations of all ceiling, wall, and floor openings for the access panels to other Contractors requiring that information.

B. Coordinate with other Contractors with respect to panel locations and group valves, traps, etc., so that they are accessible from a single panel.

1.04 MANUFACTURERS

A. Milcor, Bilco, Zurn, Larsen's, Acudor, JL, Inland Ryerson, MIFAB, Nystrom, Mitco, or Karp.

PART 2 PRODUCTS

2.01 CEILING ACCESS PANELS

A. Drywall Ceilings: Milcor Style DW, 16 gauge steel frame with 14 gauge door panel, double-acting concealed spring hinges, flush, screwdriver-operated / cylinder lock, prime-painted for finish painting with ceiling.

B. Provide access panels with "Best Master" cylinder locks.

2.02 WALL ACCESS PANELS

A. Drywall: Milcor Style DW, 16 gauge steel frame with 14 gauge door panel, double-acting concealed spring hinge, flush, screwdriver-operated / cylinder lock, prime painted for finish painting.

B. Masonry and Tile: Milcor Style M Standard / M Stainless, 14 gauge steel frame and door panel, concealed spring hinges, flush, screwdriver-operated / cylinder lock, prime painted for finished painting / Style M stainless steel finish.

C. Plaster: Milcor Style K, 16 gauge steel frame with 14 gauge door panel and 22 gauge galvanized casing beads, concealed spring hinges, flush, screwdriver-operated / cylinder lock, prime painted for finish painting.

D. Provide access panels with "Best Master" cylinder locks.

PART 3 EXECUTION

3.01 COORDINATION OF INSTALLATION

A. Coordinate size, location, and installation of panels required to permit convenient access to valves, shock absorbers, dampers, bearings, motors, filters, controls, and other equipment requiring adjustment, service, or maintenance. Mark locations of access panels on Record Drawings.

END OF SECTION

SECTION 20 05 80
VIBRATION ISOLATORS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a complete vibration isolation system to isolate motorized equipment, piping, ductwork, and appurtenances from the building structure and ceiling construction.

1.02 QUALITY ASSURANCE

A. Expected noise levels in various parts of the building shall conform to noise criteria recommendations as set forth in the current edition of ASHRAE Guide and Fundamentals. The midpoint of the range of noise criteria curves shall apply and become part of these Specifications.

B. Sound and vibration control design criteria for mechanical systems for this building shall conform to the chapter in Sound and Vibration Control in the current edition of ASHRAE Guide, HVAC Systems and Applications.

C. Vibration isolation devices, including auxiliary steel bases and pouring forms, shall be designed and furnished by a single manufacturer or supplier.

1.03 MANUFACTURERS

A. Kinetics, Korfund Dynamics Corporation, Vibration Eliminator Company, Inc., Vibration Mountings and Controls, Inc., or Mason Industries, Inc.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATORS

A. Type 1 - Pad Mounts: Precompressed molded fiberglass isolation pads, neoprene jacketed and stabilized during manufacturing. Pads shall be sized for loading from 40 to 60 psi.
   1. Kinetics Model KIP

B. Type 2 - Hanger Mounts: Vibration isolators with maximum static deflection requirements under the operating load conditions not exceeding 0.40 inch shall be hangers consisting of an elastomer-in-shear insert encased in a welded steel bracket and provided with a stamped load transfer cap. The elastomer insert shall be neoprene, molded from oil resistant compounds, and shall be color coded to indicate load capacity and selected to operate within its published load range. The hanger bracket shall be designed to carry a 500% overload without failure and to allow a support rod misalignment through a 30 degree arc without metal-to-metal contact or other short circuit.
   1. Kinetics Model RH

C. Type 3a - Spring Hanger Mounts: Vibration isolators shall be hangers consisting of a freestanding, laterally stable steel spring and elastomeric washer in series, assembled in a stamped or welded steel bracket. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity.
   1. Kinetics Noise Control Type SH

D. Type 3b - Spring Hanger Mounts: Vibration isolators where both high and low frequency vibrations are to be isolated, shall be hangers consisting of a laterally stable steel spring in series with a pre-compressed molded fiberglass insert, complete with load transfer plates and assembled in a stamped or welded steel bracket. Vibration isolators shall be pre-compressed molded fiberglass pads individually coated with a flexible, moisture impervious elastomeric membrane. Vibration isolation pads shall be molded from glass fibers with fiber diameters not exceeding 0.00027 inches and with a modulus of elasticity of 10.5 million PSI. Natural frequency of fiberglass vibration isolators shall be essentially constant for the operating load range of the supported equipment. Vibration isolators shall be color coded or otherwise identified to indicate the load capacity. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity.
   1. Kinetics Noise Control Type SFH

E. Type 3 - Spring Floor Mounts: Vibration isolators shall be freestanding, unhoused, laterally stable springs wound from high strength spring steel. Springs shall have a lateral stiffness greater than 0.8 times the rated vertical stiffness and shall be designed to provide up to 50% overload capacity. Springs shall be selected to provide operating static deflections shown on the Vibration Isolation Schedule or as indicated on the project documents. Springs shall be color coded or otherwise identified to indicate load capacity. In capacities up to 5,000 lbs., springs shall be replaceable. In capacities over 5,000 lbs., springs shall be welded to the top and bottom load plate assemblies. Springs shall be assembled between a top and bottom steel load plate. The upper load plate shall be provided with a steel leveling bolt lock nut and washer for attachment to the supported equipment. The lower load plate shall have a non-skid noise isolation pad bonded to the bottom and have provisions for bolting the isolator to the supporting structure.
   1. Kinetics Noise Control Type FDS

F. Type 4 - Spring Limit Floor Mounts: Similar to Type 3 Spring Floor Mounts, but include neoprene and steel vertical limit stops to assure a constant spring mount. Vibration isolators shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit vertical movement of the supported equipment. Housing assembly shall be formed or fabricated steel members and shall consist of a top-load plate complete with adjusting and leveling bolts, vertical restraints, isolation washers and a bottom plate with non-skid noise stop pads and holes provided for anchoring to supporting structure. Housing shall be hot dipped galvanized. Make provisions to prevent mechanical short-circuiting by isolating the limit stops.
   1. Kinetics Noise Control Type FLS.

G. Type 5 - Thrust Restraints: Spring-loaded restraint with 1 inch deflection, installed in pairs to limit movement associated with equipment thrust.
   1. Kinetics Model HSR

H. Type A - Structural Base: No additional base is provided. The isolators are attached directly to equipment that has been designed for adequate structural rigidity.

I. Type B - Structural Base: Welded structural steel frame base, individually designed and engineered by the manufacturer to support mechanical equipment and allow the use of vibration isolators. Provide main steel numbers with section depths of 3 to 12 inches. Complete with outboard isolator brackets and prelocated equipment anchor bolts.
   1. Kinetics Model SFB

J. Type D - Roof Curb Isolation Rails: Prefabricated extruded aluminum rail system incorporating 1 inch deflection freestanding stabile springs for vibration isolation and a continuous foam neoprene air and water seal. The aluminum rail shall include an integral slot anchoring springs to the bottom section, but allowing horizontal adjustment.
   1. Kinetics Model KSR-2

2.02 ISOLATOR SCHEDULE

A. Furnish isolator types as follows:

Equipment Item	Base Type	Isolator Type	Deflection (Inches)
Grade mounted Make-up Air unit (DOAS)	8	4	2.00
Floor-mounted Fan Coil Units	B	3	1.50
Small suspended fans	---	3a	0.75
Large suspended fans	---	3b	0.75
Suspended Fan Coil Units	---	3a	0.50
Unit heaters	---	3a	0.50
Air cooled condenser	A	4	0.25
Piping	---	3b	0.50
Ductwork	---	3a	0.50

2.03 MASS-LOADED VINYL WRAP

A. Limp, reinforced loaded vinyl with lead-free and asbestos-free fillers, with high-strength polyester fabric reinforcement, 1 lb. per square foot face weight. Material shall have a continuous operating range of -40 degrees F to +180 degrees F, and shall be resistant to water, oil, weak acids, alkalies, mold, and fungi. Material shall not rot, shrink or cause metal corrosion. Provide Class A fire-rating where required.

B. Type KNM-100 by Kinetics, or equal by other listed manufacturers.

PART 3 EXECUTION

3.01 PREPARATION

A. Use steel components that are phosphated and painted. Use only nuts, bolts, and washers that are zinc-electroplated.

B. Thoroughly clean structural steel bases of welding slag and prime them with zinc-chromate or metal etching primer.

C. All isolators exposed to the weather, located outdoors, or within manholes or tunnels shall have all steel parts either PVC-coated or hot-dip galvanized.

D. Use aluminum components that are etched and painted.

3.02 INSTALLATION

A. Equipment: All motorized heating and air-conditioning equipment, including fans and other equipment, shall be mounted on, or suspended with, vibration isolators.

B. Piping and Ductwork:
1. All piping over 1 inch outside diameter located in mechanical equipment rooms shall be isolated from the building structure by means of noise and vibration isolation hangers. The only exclusions are roof and floor drain piping, and all sprinkler piping.
2. All piping located less than 50 feet (or 100 pipe diameters - whichever is greater) from any connection to vibration isolated mechanical or electrical equipment, shall be isolated from the building structure by means of noise and vibration isolation hangers. All piping in the building, which is connected to vibration-isolated equipment, shall be isolated at these connections to the building structure.
3. All ductwork located in mechanical equipment rooms, and for a minimum of 50 feet from any connection to vibration-isolated air moving equipment shall be isolated from the building structure by means of noise and vibration isolation guides and supports.
4. Isolate all ductwork vertical risers from the building structure by means of noise and vibration isolation guides and supports.
5. Use vibration and noise isolating expansion hangers to isolate vertical pipe risers from the structure. The hangers shall have a minimum rated deflection of four times the anticipated pipe expansion and shall be enclosed in a housing for fail-safe operation.
6. All piping and ductwork to be isolated according to this Section of the Specifications shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain a minimum of 3/4 inch and maximum of 1 1/4 inches clearance around the outside surfaces. This clearance space shall be tightly packed with 1.58 PCF glass fiber and shall be caulked airtight after installation of the piping or ductwork, to form an acoustic seal.

C. The installed vibration isolation system for each floor or for ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shutdown conditions of 1/4 inch. Motions in excess shall be restrained by approved spring-type thrust restraints as specified or approved by submittal Drawing.

END OF SECTION

SECTION 20 05 99
REQUIREMENTS FOR CONTRACT COMPLETION

PART 1 GENERAL

1.01 DESCRIPTION

A. Following is a partial list of items that must be submitted as required before Contract Completion.
   1. All Plumbing, Fire Protection, and HVAC Contractors:
      a. Receipt for Operating Instructions and Service Manual
      b. Certificate of Equipment Demonstration
      c. Valve tags and charts
      d. Receipt for keys
      e. Warranties
      f. All required test reports as specified in other Sections
      g. All As-Built Drawings per Specifications
   2. Plumbing Contractor only:
      a. Certificate of Plumbing Inspection
      b. Certificate of Sterilization
      c. Certification that the solder or brazing used for entire new domestic water piping system is lead-free.
   3. Fire Protection Contractor only:
      a. Fire Marshal's certification of inspection and acceptance
      b. Certification from local fire department that pipe threads are suitable for their equipment.
   4. HVAC Contractor only:
      a. Certificate of Inspection
      b. Air balance report

B. In addition to the written submittals, the following material shall also be submitted prior to Contract Completion. Submit a signed copy of the Certificate of Materials Receipt. (ATTACHED TO THE END OF THIS SECTION)
   1. Loose or spare parts as specified in other Sections.
   2. Spare parts as specified in this Section.

C. Refer to Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 SPARE PARTS

A. Furnish one complete set of the following spare parts:
   1. Gaskets for manholes and handholes
   2. All air filters (does not include air filters used during construction)
   3. Special keys, wrenches, and similar required or special tools

PART 3 EXECUTION

3.01 OPERATIONAL TEST

A. At completion, operate the systems at least five (5) days, not necessarily consecutive, to demonstrate fulfillment of the requirements of the Contract. During this time, make adjustments so that equipment will perform as the manufacturer intended and systems will function as designed. Complete balancing before operating test is started.

B. Operate each system in every mode of operation and check the position of valves, dampers, and other devices for proper closure and switching.

C. Following completion of the testing described previously, sign and submit the Certificate of System Completion. (ATTACHED TO THE END OF THIS SECTION)

3.02 PERSONNEL INSTRUCTION

A. After all system operational tests have been completed, schedule an instruction period with the Owner. Instruct the Owner-designated personnel in the operation and maintenance of all systems and equipment. Use manuals to familiarize the Owner-designated personnel with equipment and procedures. Allow time as necessary for this instruction. Schedule time convenient for the Owner and the Architect.

B. The instruction is to include the following:
1. Location of items of equipment and explanation of their use
2. Reference to service manual for record and clarity
3. Coordination of written and verbal instructions so that each is understood by personnel
4. Explanation of control system
5. Complete review of items in the manuals
6. Maintenance procedures to be followed by the Owner

C. At the completion of instruction, have all attendees sign the Certificate of System Completion. (ATTACHED TO THE END OF THIS SECTION)

END OF SECTION

CERTIFICATE OF MATERIAL RECEIPT

Project Name: _____

Date: _____

Contractor: _____

Contractor's Representative: _____

On the date listed previously, the following pieces of equipment, as required by the Project Specifications, were delivered to the Owner's representative:

Equipment	Quantity
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

(Attach a separate page for additional items)

Owner's Representative: _____ (PRINT)

_____ (SIGN)

CERTIFICATE OF SYSTEM COMPLETION

Project Name: _____

Contractor: _____

System: _____

Specification Section Number: _____

A. Manufacturer's Inspection and Approval (if required by specification section)

The previously identified system has been inspected and approved as meeting the manufacturer's written instructions for installation and operation.

Manufacturer's Representative: _____ Date: _____

B. Testing

The previously identified system has passed all testing required by the Project Specifications and has met the terms of the contract. Written test results are attached.

Contractor's Representative: _____ Date: _____

C. Equipment Demonstration

The previously identified system has been demonstrated to the following Owner's representatives:

Name	Title	Date	Signature
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

(ATTACH A SEPARATE PAGE FOR ADDITIONAL NAMES)

SECTION 21 05 01
FIRE PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Connect to new 4" underground fire service line 5' from the building and extend into new mechanical room. Coordinate location with Site Utility Contractor. Refer to the drawings for location and routing.

B. Connect to new 4" Fire Department Connection (remote mounted) line 5'from the building and extend into new mechanical room. Make connection to the sprinkler system inside the building. Coordinate location with Site Utility Contractor. Refer to the drawings for location and routing.

C. Furnish material, labor, tools, accessories and equipment, final fabrication Drawings and detailed system design to complete and leave ready for operation all Fire Protection systems of this Project, as described in these Contract Documents and as shown on the Drawings, and as otherwise required for a complete installation which complies with all codes having jurisdiction.

D. Refer to Sections 20 00 00 through 20 99 99 (as included) for items of a general nature which apply to this portion of the work. Sections 21 00 00 through 21 99 99 (as included) also describe Fire Protection Work.

E. It is the intent that the Fire Protection Work be complete in every respect.

F. Use sufficient journeymen and competent supervisors in execution of this portion of the work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed Fire Protection work, no allowance will be made for lack of skill on the part of workmen.

G. Coordinate location of all work with other Contractors and equipment.

H. Sprinkler system and shall be hydraulically calculated and sized.

I. Locate sprinkler heads so they are symmetrical.

1.02 SITE WORK

A. All site work including underground service mains, fire hydrants and P.I.V. are the responsibility of Site Utility Contractor.

1.03 QUALITY ASSURANCE

A. Standards: American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), National Fire Protection Association (NFPA), Underwriters' Laboratories, Inc. (UL) and Factory Mutual (FM), American Water Works Association (AWWA), American Standards for Testing Materials (ASTM), and Ohio Building Code (OBC).

B. All Fire Protection work shall comply with applicable NFPA and Local Code requirements and contract documents.

1.04 DRAWINGS

A. Drawings are schematic showing the type of systems, scope of systems and general location of alarm valves, sprinkler heads, main piping and standpipes and equipment, air compressors, fire hose cabinets, fire valve cabinets and kitchen hood fire suppression system. Drawings indicate the basis of design and general arrangement of the fire protection systems for use by the Contractor in developing the detailed systems design. The detailed system design is the responsibility of the Contractor. Not all system details, heads, and other materials are shown on the Contract Documents. No additional payment will be made for such details or materials required to comply with codes or to secure a building permit. Contractor's design-build responsibilities include providing everything required for a complete system which complies with the conditions of the Contract Documents and the codes having jurisdiction.

B. Drawings are schematic showing the type of systems, scope of systems and location of sprinkler heads, main piping, standpipes, fire pump, and equipment, air compressors, fire hose cabinets, fire valve cabinets, and kitchen hood suppression system.

C. The number and location of sprinkler mains, branch piping and heads and standpipes shall be coordinated with other architectural, structural, mechanical, and electrical equipment items such as ceiling panel patterns, beams, diffusers, speakers, and light fixtures. The Fire Protection Contractor shall coordinate any and all changes in this layout with all other Contractors and notify the Architect immediately of any changes in location or other conflicts that may affect either the fire protection coverage or the work of other Contractors.

D. The work shall be installed as required by applicable codes and governing agencies. Furnish the necessary valves, fittings, devices and accessories required, including all hangers, inserts, and other accessories. Locate sprinkler heads in a pattern so spaced as to meet the minimum requirements of the Governing Authorities involved and coordinate their locations so as not to interfere with work by any other Trade.

E. The Contractor is responsible for the hydraulic calculations design, installation, obtaining all approvals for the Fire Protection Systems, and preparing complete working Shop Drawings of the entire Fire Protection System. The Contractor shall submit the hydraulic calculations and Shop Drawings approved by the AHJ to the Architect/Engineer for record purposes. Shop Drawings shall bear the stamp of a registered Professional Engineer or a State Certified Sprinkler Designer. Submit to the local Authority Having Jurisdiction (AHJ) for approval. Provide a copy of this "Stamped" document to the Engineer for record. See Section 20 05 15, "Submittals" for additional submittal requirements.

F. Submit Shop Drawings and calculations for review after submission to approving authorities and shall bear their stamp (and have key plans on each Shop Drawing indicating location in each building area).

G. No additional money will be allowed for additional heads and piping required after code review.

1.05 LICENSES

A. The installation of this Fire Protection work shall be made only by a Contractor and craftsman licensed and certified by the City, County, and State to work on fire protection systems.

B. Include copies of the Certificate of Approval in the Record and Information Manuals turned over to the Owner.

1.06 FEES

A. This Contractor shall pay for all permits, inspection fees, and other charges related to the installation of the Fire Protection work.

1.07 COMPLETION OF FIRE PROTECTION SYSTEM

A. The Fire Protection system shall not be considered complete and acceptable unless and until all Code and Governing Agency requirements are satisfied.

B. All control valves, alarm devices, supervisory devices, drain valves and gauges shall be checked for proper operation. A written record of these checks shall be submitted to the Architect.

C. Final completion of the work shall require successful completion of all required testing and approval, and submittal of the Contractor's Material and Test Certificate.

END OF SECTION

SECTION 21 05 02
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide UL listed, FM approved fire protection specialties or accessories as required by either the equipment manufacturer or the Local Code Authority.

B. Standards: Currently listed as approved in the "Fire Protection Equipment List" as published by Underwriters' Laboratories, Inc. (UL), or the Factory Mutual System Approval guide (FM) and shall bear the proper labels as identified therein.

C. The Fire Protection Contractor provides and installs supervisory valve and flow switches. The Electrical Contractor provides wiring.

1.02 MANUFACTURERS

A. Reliable, Viking, Autocall, Star, Guardian, Gem, Globe, Central Sprinkler, Potter-Roemer, Potter, Notifier, Elkhart Brass, Simplex, Croker, Victaulic, W.D. Allen or Automatic Sprinkler.

PART 2 PRODUCTS

2.01 FLOW SWITCH

A. Vane-type switch, weather-resistant adjustable pneumatic time delay 90 seconds or less, two (2) sets of single-pole double-throw micro-switches, tamper-proof cover (extra set of contacts), steel U-bolt clamp, saddle type mounting directly to piping.
   1. Potter-Roemer Fig. 6200 series.

2.02 SUPERVISORY (TAMPER) SWITCH

A. Weather-resistant, single-pole, double-throw switch, roller type switch actuator, spring-loaded plunger, tamper-proof cover (extra set of contacts).
   1. Potter-Roemer Fig. 6220.

2.03 PRESSURE GAUGE

A. Dial spring, brass case, 3 1/2 inches diameter, 1/4 inch NPT male connection, range: 0-300 psig.
   1. Reliable Model UA.

2.04 ELECTRIC SPRINKLER ALARM SWITCH

A. Two (2) single-pole, double-throw snap-acting electric switches, spring loaded plunger, self-setting, 4-20 psi adjustable range, 180 degrees F, NEMA 1 enclosure, with tamper switch.
   1. Potter Model PS10-2A.

2.05 INSPECTOR'S TEST CONNECTIONS

A. Sight Test Connection:
1. Steel, clear tube, smooth bore, non-corrosive orifice with flow equivalent to one (1) sprinkler head, 1 inch NPT connection.
2. Reliable Model B or equivalent test module Victaulic 718 or "Test-an-Drain."

B. Blind Test Connection:
1. Bronze, non-corrosive, smooth bore orifice with flow equivalent to one (1) sprinkler head, 1 inch NPT connection.
2. Reliable Model A or equivalent test module Victaulic 718 or "Test-an-Drain."

2.06 IDENTIFICATION SIGNS

A. All control, drain, and test valves shall have marked identification signs indicating the portion of the system controlled by each valve. Reliable Model A.

B. 18 gauge steel, porcelain enameled, white lettering on red background.
1. General Purpose Valve Control - Reliable Style A
2. Specific Identification - Reliable Style B
3. Fire Alarm - Reliable Style D
4. Hydraulic Calculated System - Reliable Style E

C. 20 gauge steel, porcelain enameled, white lettering on red background.
1. Cold Weather - Reliable Style C

D. Locate signs per NFPA 13 requirements.

E. When item being identified is above suspended ceiling, sign is to be placed on nearest ceiling pad below shut-off valve or other item being identified.

F. Signs shall be secured with noncorrosive wire, chain(s) or other approved means.

2.07 DRAINS

A. Furnish drains using Schedule 40 black steel pipe (ASTM A120). Exterior piping shall be galvanized steel (with no raw steel exposed) or non-ferrous to prevent staining exterior walls.

2.08 HANGERS

A. Refer to Section 20 05 45, "Hanger, Supports, and Inserts" which is part of this contract work.

B. All component parts of hanger assemblies shall be listed by UL listed, FM approved, and NFPA.

C. All hangers shall support the total load of the water-filled pipe in addition to a minimum of 250 lb. load applied at the hanger.

D. All hangers installed shall be appropriate for type of building structure indicated.

E. C-clamps without retaining straps are expressly prohibited.

2.09 SPRINKLER GUARDS

A. Welded wire steel, baked synthetic red enamel finish, for use with 1/2 inch or 3/4 inch NPT male pipe threads, 2 3/4 inches by 3 inch square base, 2 7/8 inches high.
   1. Reliable Model B.

2.10 BAFFLES

A. 18 inches by 18 inches galvanized steel.
   1. Potter-Roemer, Inc. Fig. 5021-D.

2.11 WATER MOTOR GONG

A. Cast iron body, plastic impeller, cast aluminum gong, red finish, 3/4 inches inlet piping, 1 inch drain outlet in body housing.
   1. Reliable Model C.

2.12 ELECTRIC ALARM BELL

A. Reliable "Supertrol" 6 inch electric alarm bell with Model WBB weatherproof back box.

B. Furnished and installed by the Fire Protection Contractor, wired by the Electrical Contractor.

2.13 BACKFLOW PREVENTERS

A. 175 lb. SWP, reduced pressure (ASSE 1013), bronze or cast iron body, with vents, inlet, and valve test cocks, neoprene, discs, Buna-N or plastic disc-stainless spring interior check and differential pressure relief valves, air gap drain funnel, 32 degrees F to 145 degrees F meeting the requirements of the Local Water Department. Install strainer on inlet.
   1. Acceptable Manufacturers: Watts 909 Series, Hersey, Cla-Val Company, Wilkins, or Ames.
   2. Provide air gap drain funnel fitting. Provide drain from funnel to the nearest drain.

B. Backflow preventers shall be serviceable without removal from pipe line.

C. Backflow preventer shall have a permanently attached plate indicating type and listing approvals.

2.14 STRAINERS

A. Watts 77F-250 series, cast iron flanged (ANSI B16.1) body with stainless steel screen tapped for closure plug. Provide blow-off valve. Screen size 3/16 inch perf.
   1. Watts, Nibco, Braukmann.

2.15 SPRINKLER PIPING COVERS

A. NFPA, FM Approved, UL Listed 18 / 20 / 22 gauge cold rolled steel primer for painting, for pendant or sidewall installation, with snap-lock brackets, end caps, corners, wall flanges and couplings to make-up a complete pipe covering system where indicated on Drawings.
   1. Soft-Steel System or approved equal.

2.16 AIR VENTS

A. Brass construction, Brass strainer with 40 mech, union connection, ½" inlet and ½" outlet. Pott Model PAV

PART 3 EXECUTION

3.01 INSTALLATION

A. Install supervisory switches on all operable valves except fire department valves. Refer to Drawings.

B. Install flow switches at locations indicated on the Drawings and as required.

C. Do not install a flow switch within 12 inches of a "tee" or "elbow" or within 18 inches of a gate valve.

D. Install pressure gauges on top of each standpipe, sprinkler riser at each test connection and where shown on the Drawings.

E. Pressure gauges shall be located where water will not freeze, provided with a shutoff valve and with provision for draining.

F. All drain and Inspectors Test piping passing through an exterior wall shall be galvanized or non-ferrous. No raw steel surface shall be exposed.

G. Install a blind test connection in test pipes connected to an open drain and a sight test connection in test pipes that connect to closed drains.

H. Install water motor gong on exterior building wall where directed by Architect.

I. Install all necessary pipe hangers of approved spacing, type, and size per NFPA 13.

J. Provide splash blocks for all drain and inspectors test outlets occurring in sodded areas.

K. Install baffles on sprinkler heads less than 6 feet apart.

L. Provide full-size drain from backflow preventer air gap drain funnel to 2 inches from finished floor.

M. Provide automatic ball drip valve on line to siamese and fire pump test connections. Extend ball drip valve drain line to floor / nearest drain.

N. Install sprinkler piping covers plumb and per manufacturer's recommendations.

O. Install automatic air vents on high points of the system and bleed all air from the system. Pipe outlet to nearest floor drain, mop sink, or to the exterior.

3.02 COORDINATION OF WIRING

A. Required wiring from fire protection specialties to the fire alarm panel is provided by the Electrical Contractor.

B. Electric alarm bell's wiring is to be interlocked with the fire alarm riser pressure switch. Wiring is provided by the Electrical Contractor.

END OF SECTION

SECTION 21 05 23
FIRE PROTECTION VALVES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide UL listed, FM approved and labeled valves for the fire protection water piping system shown on the Drawings.

B. Tag all valves, provide valve chart per Project Specifications.

1.02 QUALITY ASSURANCE

A. Standards: Underwriters' Laboratories (UL), Factory Mutual (FM) and National Fire Protection Association (NFPA).

B. All valves of the same type used on the project shall be by the same manufacturer, except as noted.

PART 2 PRODUCTS

2.01 SWING CHECK VALVE (UP TO 2 INCHES)

A. UL listed, FM approved, 200 lb. (WWP) Y-pattern, bronze body, brass disc, threaded bonnet.

B. Nibco or approved equal.

2.02 SWING CHECK VALVE (2 1/2 INCHES AND LARGER)

A. UL listed, FM approved, 175 lb. (WWP) cast iron body; brass moving parts including clapper valve seat and pivot shaft, Buna-N "O" ring, flanged connections.

B. Viking, Gem, Reliable, Central, Mueller, Automatic Sprinkler, Nibco, Watts, Star or Victaulic.

C. The use of interior springs to assist closing of disc(s) shall not be accepted.

2.03 BRONZE GATE VALVES (UP TO 2 INCHES)

A. UL listed, FM approved, 175 lb. (WWP) bronze body, threaded ends, OS & Y rising stem, bronze yoke, solid wedge, repackable when wide open.
   1. Fire Suppression System Manufacturer, Nibco, Watts, Mueller, Stockham, Kennedy, Crane or Victaulic.

2.04 IRON BODY GATE VALVES (2 1/2 INCHES AND LARGER)

A. UL listed, FM approved, 175 lb. (WWP) high strength reinforced alloy iron body and bonnets, 125 lb. ANSI flanges, OS & Y rising stem, renewable bronze yoke bushing, bronze seat rings, solid taper wedge, repackable when wide open, blind bosses for drain tapping.
   1. Fire Suppression System Manufacturer, Nibco, Watts, Mueller, Stockham, Kennedy, Crane, or Victaulic.

2.05 BRONZE GLOBE VALVES (UP TO 2 INCHES)

A. UL listed, FM approved, 300 lb. (WWP) bronze body, threaded ends, integral seats, Nitrile rubber disc, bronze stem and lock nut.
   1. Fire Suppression System Manufacturer, Nibco, Watts, Mueller, Stockham, Kennedy, or Crane.

2.06 BUTTERFLY VALVES (IN LIEU OF GATE VALVES 2 1/2 INCHES AND LARGER)

A. UL listed, FM approved, 175 lb./300 lb. (WWP) ductile iron body, EPDM coated ductile iron disc, stainless steel stem, EPDM seal, phenolic ring, grooved mechanical connections, built-in supervisory switch, position indicator, cast iron wheel handle with gear operator.
   1. Fire Suppression System Manufacturer, Nibco, Watts, Gem, Victaulic, or Sprink JPL Watchman.

2.07 PRESSURE REDUCING VALVE

A. Main Line Valve: Cast iron, single seated, hydraulically operated, pilot-controlled, diaphragm-type globe valve with 300 psi rating and UL listed.
   1. Cla-Val or equal.

B. Fire Department valve and sprinkler branch lines: Chrome plated brass body, micro-meter-type adjustment and breakable segment control. UL listed, FM approved.
   1. Elkhart Brass Manufacturing Company, Croker-Standard or Potter-Roemer.

2.08 MISCELLANEOUS VALVES

A. All valves to be UL listed, FM approved.

B. Angle Valves: 175 lb. (WWP) bronze, rubber disc, wheel handle.
   1. NIBCO or equal.

C. Hose End Gate Valves: 175 lb. (WWP), bronze, solid wedge, screw-in bonnet non-rising stem, iron handwheel with cap and chain.
   1. NIBCO or equal.

D. Hose End Angle Valves: 175 lb. (WWP), bronze, renewable composition disc, iron handwheel w/cap and chain.
   1. NIBCO or equal.

E. Test Valve: 300 lb. (WWP) bronze, three-way, needle seat, integral tapered disc, wheel handle.
   1. NIBCO or equal.

2.09 WET PIPE ALARM VALVE AND TRIM

A. UL listed, FM approved, 175 lb. (WWP), cast iron body, tapped bases for alarm accessories, pressure gauges, drain, bronze moving parts, including clapper and bushings, rubber gasket, flanged connections.

B. Trim: Include retard chamber, pressure switch, strainers, gauges, fittings, piping and drain, control, and test valves.

C. Reliable, Victaulic, Gem, Globe, Viking, Central, Automatic Sprinkler, or Star.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install valves and accessories as indicated on the Drawings and as required by NFPA 13 and 14 and in locations that are accessible to qualified personnel.

B. Tag all valves as required.

C. Provide pressure reducing valves at all standpipe hose valves where pressure exceeds 100 psi.

D. Torque hose end valve caps to prevent unauthorized use or removal.

E. Install hose end valves pointed down and away from wall at 15 degrees.

3.02 COORDINATION

A. Coordinate location of valves with Architect.

B. Coordinate location of access panels as required with Architect and Contractors.

END OF SECTION

SECTION 21 13 13
WET SPRINKLER PIPING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Connect to 4" fire water service line and 4" fire department connection line 5 feet outside building where shown on Drawings. Extend lines into building to 12 inches above building floor slab. Extend to backflow preventer, wet pipe alarm valve, from alarm valve to sprinkler system. Refer to Drawings.

B. Provide sprinklers and piping to provide coverage of all new areas of the Building unless otherwise noted on Drawings.

C. Sprinkler system shall be sized based on hydraulic calculations. The water flow velocity anywhere within the piping system shall not exceed 25 feet per second.

D. Suppression systems for electrical equipment rooms, elevator equipment rooms, technology rooms, or similar spaces shall be designed so as not to present a hazard to occupants or equipment.

E. Test new complete system.

1.02 QUALITY ASSURANCE

A. Standards: National Fire Protection Association (NFPA 13 and 25), Underwriters' Laboratories Inc. (UL), and Factory Mutual (FM), American Standards for Testing Materials (ASTM), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Water Works Association (AWWA), and Ohio Building Code (OBC).

1.03 BUILDING FIRE HAZARD CLASSIFICATION

A. Light Hazard, Ordinary Hazard, or Intermediate.

1.04 CEILING TEMPERATURE COORDINATION

A. It shall be the responsibility of this Contractor to install sprinklers having the proper temperature ratings. Contractor shall check ceiling temperatures as needed to determine proper sprinkler head temperature ratings.

1.05 MANUFACTURERS

A. Reliable, Gem, Globe, Automatic Sprinkler, Viking, Victaulic, Star or Central.

PART 2 PRODUCTS

2.01 PIPING

A. Interior Piping:
1. Electric-resistance welded steel (ASTM A135).
2. Wrought steel (ANSI/ASME B36.10M).
3. Welded and seamless steel (ANSI/ASTM A53).
4. Galvanized, welded and seamless steel (ASTM A795).
5. Type "L" seamless copper tubing (ASTM B88).

B. Exterior Piping:
1. Underground piping from 5 feet outside building wall to a point above floor slab shall be ductile cast iron pipe, cement-lined (AWWA C104), enamel coated, thickness Class 53, 250 lb. working pressure, push-on joints, rubber gaskets, mechanical joints at valves and fittings (ASTM A377, AWWA C151).
2. Clow "Super Bell-Tite," American Cast Iron Pipe Company or U.S. Pipe & Foundry.

C. Piping shall be UL listed, FM approved. Minimum pipe wall thicknesses shall be in strict accordance with NFPA Standards.

2.02 FITTINGS

A. Cast iron screwed or flanged fittings, 125 lb. or 250 lb. SWP as required, (ASME B16.4 and B16.1).

B. Malleable iron screwed fittings, 150 lb. or 300 lb. SWP as required (ASME B16.3).

C. Factory-made wrought steel, butt-weld fittings (ASME B16.9).

D. Butt welding ends for pipe, valves, flanges and fittings (ASME B16.25).

E. Steel pipe flanges and flanged fittings (ASME B16.5).

F. Forged steel fittings, socket welded and threaded (ASME B16.11).

G. Wrought copper and bronze solder-joint pressure fittings (ASME B16.22).

H. Grooved-end type fittings and couplings (ASTM A47) are acceptable only with roll-grooved piping. Fittings shall be by Victaulic, Gruvlok, or Grinnell.

I. UL listed, FM approved Copper Pipe Extracted Fitting (T-Drill): An extracted mechanical tee joint may be made in copper tube. The joint shall be made using tooling specifically designed for this type of joint, and the tooling shall extrude a collar with a minimum height of three times the thickness of the tube wall. The branch tube shall be beveled to match the contour of the main run of the piping and dimpled to control the depth of insertion. The fitting penetration shall not impede the free flow within the piping system. The joint shall be completed using a certified method of brazing in accordance with ASME brazing requirements. The brazing filler material shall be of the copper phosphorous classification. This joining method shall be in strict accordance with the written installation instructions as published by T-Drill Industries, Inc.

J. Fittings shall be UL listed, FM approved.

2.03 SOLDER AND BRAZING ALLOYS

A. Brazing filler metal (Classification BCUP-3 or BCUP-4) (AWSA5.8).

B. Solder metal, 95/5 Tin-Antimony-Grade 95 (ASTM B32).

2.04 SPRINKLERS

A. General: All sprinklers shall be UL listed, FM listed and bear an approved stamp or label.

B. Construction: Automatic spray, quick response, glass bulb type, bronze tensioned frame, directional deflectors, and threaded connection. Orifice and connection size to be determined by density requirements and hydraulic calculations.

C. Provide the following sprinkler head types:
1. Provide semi-recessed, sidewall, or pendent heads with adjustable recessed escutcheon in areas with finished ceilings.
2. Provide upright heads in areas without ceilings.
3. Provide guards for pendent or upright sprinkler heads in storage and service areas.
4. Provide non-freeze heads where indicated on the drawings.

D. Temperature Ratings:
1. Unless otherwise noted, furnish Ordinary Class, 135 to 170 degree F sprinklers, except in the following areas:
   a. Mechanical Rooms: Intermediate Class, 177 to 225 degrees F.
   b. Electrical Rooms and Technology Rooms: Intermediate Class, 175 to 225 degrees F.
   c. Near Heating Equipment: Intermediate Class, 175 to 225 degrees F.
   d. Kitchen: Intermediate Class, 175 to 225 degrees F.
   e. Skylights: Intermediate Class, 175 to 225 degrees F.
   f. Any Rooms or Areas where Temperature shall exceed the Normal Building Temperature: Intermediate Class, 175 to 225 degrees F.
   g. Special areas as may be noted on Drawings.

E. Finish:
1. Provide a custom color of factory applied paint as selected by the Architect to all concealed type of sprinkler heads.
2. Provide white finish for semi-recessed, sidewall, and pendent heads and escutcheon plates.
3. Provide brass finish for upright heads in areas without ceilings.
4. Provide white sprinkler heads and escutcheons with solid metal base (no holes) for skylights.

F. Spare Heads:
1. This Contractor shall provide a sprinkler head wrench and a stock of spare heads in a cabinet for future use for each type and temperature rating of head installed. Furnish quantity of each type and temperature rating per the following schedule:

NUMBER OF HEADS	EXTRA HEADS
Up to 300	6
301 – 1000	12
Over 1000	24

2. Mount sprinklers and wrench in cabinet and install cabinet on wall next to alarm valve or on alarm valve piping.

2.05 FLEXIBLE SPRINKLER DROPS (OPTIONAL)

A. Flexible sprinkler connection assemblies shall be fully welded, non-mechanical fitting type, with minimum 1 inch internal diameter corrugated type 304 stainless steel hose, type 304 stainless steel braided outer cover and collar, 1 inch NPT male inlet and stainless steel or carbon steel 1 inch x 0.5 inches or 1 inch x 0.75 inches NPT female reducer outlet. Seals, when utilized, shall be EPDM. Ceiling bracket shall be direct attachment type having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws and a removable attachment hub with a set screw. Ceiling attachment shall incorporate a tamper resistant label for visual verification of inappropriate removal or relocation. The flexible sprinkler connection assembly shall be UL listed and FM Global approved for fire protection service, and seismically qualified pursuant to ICCESAC- 156.

B. Acceptable Manufacturers: Victaulic, FlexHead Industries Inc., or approved equal.

C. Type: Stainless steel, braided flexible connection may be used where approved by the local authority having jurisdiction and used in accordance with the manufacturer's specific listings and recommendations. All flexible drop connections shall be UL and FM approved; pressure tested to a working pressure of 175 PSI. The product shall be factory tested and rated for a failure pressure of not less than 300 PSI.

D. Minimum diameter of flexible drop connections shall be not less than 1 inch IPS. Lengths shall be 2 feet minimum to 6 feet maximum.

E. General: All sprinklers shall be UL listed and FM listed and bear an approved stamp or label.

PART 3 EXECUTION

3.01 INSPECTION

A. Schedule all inspections required by all Codes and Governing Agencies.

3.02 INSTALLATION

A. Piping:
1. All piping shall be arranged in accordance with the best standards of the trade, with risers plumb and horizontal mains and branches run parallel or perpendicular to the building walls.
2. Securely fasten pipe and support with hangers that meet NFPA requirements, spaced not less than 12 inches or more than 18 inches from a sprinkler head. One hanger on each length of pipe and on cross mains between each branch line.
3. Install all piping and valves as required in connection with this installation. Install all necessary standard hangers and special hangers of approved type and size. Refer to other sections within these Specifications regarding hangers, supports, and inserts.
4. All piping in interior areas having ceilings shall be concealed, unless noted otherwise.
5. No wet piping to be installed in areas where space temperature may drop below 40 degrees F.
6. All piping systems shall be installed with adequate provisions made for expansion and to prevent stresses on valves and equipment. Provide adequate pipe anchors and guides and support from building structure.
7. Pitch piping to drain toward alarm valve and make provisions to drain all piping. Provide auxiliary drains where necessary.
8. Ceiling grid systems shall not be supported from, or used to support from, or used to support, electrical conduit, sprinkler lines, or any other utility lines. Each utility and the ceiling grid system shall be independently supported from the building structure, concrete, steel, or masonry. Where interferences occur, in order to support piping, conduit, ceiling grid systems, trapeze-type hangers or supports will have to be employed and shall not be located where they interfere with access panels, valves and other mechanical equipment items.
9. Drain/test pipes shall be installed at base of sprinkler riser.
10. All drain and test piping passing through an exterior wall shall be galvanized or non-ferrous. No raw steel surface shall be exposed.
11. Install flow and supervisory switches where shown on Drawings. Wiring provided by the Electrical Contractor.
12. Tag and identify all piping and valves installed under this work.
13. All drains/test pipe locations shall be approved by Local Fire Department and Architect.
14. Provide all necessary adaptors, fittings and piping required to make connections to the water service piping.
15. Escutcheon plates shall be installed tight to the ceiling where sprinkler heads are either mounted below acoustical tile ceiling, drywall ceiling or protrude from wall or soffit.
16. Shop fabricated pipe shall be delivered to the site and installed free of bends, dents, and other defects.
17. All sprinklers shall be installed in the field.

B. Joints:
1. Threaded Pipe and Fittings:
   a. Ream pipe ends to full cross sectional area after cutting.
   b. Threads shall conform to ANSI Standard B2.1.
   c. Joints shall be made with TFE tape, applied to male thread only.

2. Welded Pipe:
   a. All welding and brazing shall be done by an AWS-Certified welder in accordance with the American National Standards Institute "Code for Power Piping, Pressure Piping," (ANSI B31).
   b. All welders or brazers shall be certified by this Contractor as being qualified for welding and/or brazing in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators."
   c. Torch cutting of pipe is prohibited.
   d. Butt-welded joints shall have substantially full penetration and recommended bead reinforcement.
   e. Slip on, socket, and fillet welds shall have geometry indicated in the "Code for Pressure Piping" (ANSI B31).
   f. All slag and other welding residue shall be removed as work proceeds and at completion.
   g. Shop and field welded connections shall be made without damaging the piping.
3. Mechanical Joints (Exterior Piping):
   a. Bolts for steel, cast iron, brass and bronze, 250 lb. SWP and 450 degrees F or under, shall be carbon steel with American Standard Regular, square heads and American Standard heavy hexagon, semi-finished nuts.
   b. ASME A307, Grade B, tee head, high tensile steel bolts, and nuts may be used.

C. Locate sprinkler heads in ceilings so they are symmetrical.

D. Install sprinkler heads in center of ceiling tile in lay-in ceiling system to within 1 inch of exact center of ceiling grid. Refer to details on Drawing.

E. Escutcheons and cover plates shall be installed tight to the surface where sprinkler heads are either mounted in acoustical tile ceiling, drywall ceiling, or protrude from wall or soffit.

3.03 TESTS

A. After all tests have been completed, the Contractor's Material and Test Certificate required by NFPA 13 shall be completed and forwarded to the Authorities Having Jurisdiction.

B. The sprinkler system shall be tested hydrostatically at 200 psig for two (2) hours. The hydrostatic test pressure shall be measured at the low point of the individual system or zone being tested. There shall be no visible leakage during the hydrostatic testing.

C. Comply with NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems."

D. Provision shall be made for the disposal of water issuing from test outlets to avoid property damage.

E. Brine or other corrosive chemicals shall not be used for testing systems.

F. Tests shall be observed by Approving Authorities and the Architect's Representative.

3.04 WIRING

A. Alarm wiring from the wet pipe alarm valve to the fire alarm panel by the Electrical Contractor.

END OF SECTION

SECTION 22 05 01
PLUMBING

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish material, labor, tools, accessories and equipment to complete and leave ready for operation all plumbing systems of this project as described in these Specifications and as shown on the Drawings.

B. Refer to Sections 20 00 00 through 20 99 99 (as included) for items of a general nature which apply to this portion of the work. Sections 22 00 00 through 22 99 99 (as included) also describe Plumbing work.

C. It is the intent that the Plumbing Work be complete in every respect.

D. Use sufficient journeymen plumbers and competent supervisors in execution of this portion of the work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed plumbing, no allowance will be made for lack of skill on the part of workmen.

E. Coordinate location of all work with other Contractors and equipment.

F. Plumbing Rough-in and Final Connections
1. Provide service rough-ins and make final connections to equipment furnished by the Equipment Contractor or the Owner.
2. Install plumbing equipment furnished by the Owner, unless otherwise noted.
3. Provide piping, valves and specialties as required and as specified under other Sections of these Specifications.

G. Equipment Connections
1. Make final connections to equipment. Coordinate rough-in locations with other Contractors and the Owner.
2. Refer to approved equipment Drawings for exact rough-in sizes and locations.
3. Provide stops on supplies to equipment not otherwise furnished with integral stops.

1.02 LICENSES

A. The installation of this plumbing work shall be made by a Contractor and craftsmen licensed by the City, County, or State.

B. Obtain from the State Department of Health, a Certificate of inspection and approval. Certificate of approval is to be inserted in the record and information manuals turned over to the Owner.

C. Pay for all permits, tapping fees, inspection fees, meter cost, and other charges related to Plumbing work listed.

END OF SECTION

SECTION 22 05 02
PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide plumbing piping specialties or accessories as listed herein or specified or indicated on Drawings.

1.02 QUALITY ASSURANCE

A. Standards: Plumbing and Drainage Institute (PDI), American Society of Sanitary Engineering (ASSE), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), National Sanitation Foundation (NSF), American Society for Testing and Materials (ASTM), and the Manufacturers' Standardization Society of the Valve and Fittings Industry (MSS).

B. All cast brass or bronze products shall be certified to be lead-free and meet EPA Standards when installed in the waterway used for drinking.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. 4 1/2 inch diameter dial, glass face with standard stainless steel bourdon tube spring, black die cast aluminum case, 0 to 160 psig range, ±0.5% of span accuracy, provided with ball valve.
   1. Weiss Model 4PGA-1, Trerice, Ashcroft, Miljoco, Marsh, or Marshalltown.

2.02 THERMOMETERS

A. Industrial thermometer, heavy-duty casing, 9 inch scale, mercury-free, non-toxic, organic spirit-filled, front double strength window, adjustable angle, 30 to 240 degree F range with required insertion length to sense fluid temperature (1.5 inches minimum), brass or stainless steel separable sockets of required length with insulation extension and heat transfer paste, recalibration feature.
   1. Weiss Model, Miljoco, Trerice, Ashcroft, Marsh, or Marshalltown.

2.03 BACKFLOW PREVENTERS

A. 175 lb. SWP reduced pressure (ASSE 1013), bronze or cast iron body, with vents, inlet/outlet valves, test cocks, neoprene discs, Buna-N or plastic disc-stainless spring, interior check and differential pressure relief valves, air gap drain funnel, 32 degrees F to 145 degrees F. Temperature range and meeting the requirements of the local water department and EPA. Backflow preventer shall be serviceable without removal from pipe. Install strainer on inlet.
   1. 1/2 Inch to 3 Inches: Watts Model 009 with air gap drain funnel.
   2. 4 Inches to 10 Inches: Watts Model 909 Series with air gap drain funnel.

3. Acceptable Manufacturers: Watts, Ames, Cla-Val Company, Conbraco, Hersey or Wilkins.
4. Pipe backflow preventer drain through air gap fittings and down to 2 inches above nearest floor drain. Secure and support drain line.

B. Coffee, ice, vending, and carbonated beverage machine backflow preventer:
1. ASSE 1022 approved, continuous pressure type, chrome brass body, stainless steel springs and parts, double-check valve assembly, strainer, FDA approved.
2. Alternative engineered design based on 2021 IPC: ASSE 1024 approved, continuous pressure type, lead-fee copper silicon body, engineered composite checks, EDPM seals, stainless steel springs, double-check valve assembly, NSF approved

C. Manufacturers and their models shall be approved by the EPA.

2.04 VACUUM BREAKERS

A. 125 lb. SWP (ANSI 112.1.1, ASSE 1001) bronze body construction, chrome plated, full line size with body trim, disc float, full size orifice. (For use without continuous backpressure.)
1. Watts No. 288C, Conbraco, Lawler, Wilkins, or Clayton.

B. 150 lb. SWP (ASSE-1056) bronze construction, 3/8 inch and 1/2 inch size, body trim, disc float, anti-siphon, spill-proof. (For use with continuous back pressure.)
1. Watts No. 008QT, Conbraco, Wilkins, Hersey or Clayton.

2.05 WATER PRESSURE REDUCING VALVES

A. 1 1/2 Inches and Smaller: All bronze body, lead free, stainless steel renewable seats, reinforced Buna-N diaphragm and valve disc (ASSE 1003) and a separate inlet strainer with stainless steel screen. Provide with low pressure range (10-35 psig) or higher pressure range (1/2 inch to 1 1/4 inch 50-145 psig; 1 1/2 inch 50-95 psig). Refer to Drawings for pressure ranges.

B. 2 Inches to 24 Inches: Flanged ductile iron body, Class 125 rated at 175 psig, pressure reducing balanced control valve with V-port throttling, stainless steel seat, stainless steel tubing and large control filter.

C. Provide strainer upstream of pressure reducing valves.

D. Acceptable Manufacturers: Watts, Apollo, Bermad, Cla-Val, Cash-Acme, or Zurn.

2.06 WATER PRESSURE RELIEF VALVE

A. Bronze body, diaphragm-activated, phosphor-bronze diaphragm and renewable seat disc, adjustable pressure settings. Refer to Drawings for pressure setting.

B. Acceptable Manufacturers: Watts, Apollo, Zurn, or Cash-Acme.

2.07 SHOCK ABSORBERS

A. Shock absorbers shall conform to ASSE Standard 1010, PDI WH-201 and ANSI A112.26.1M-1984, stainless steel / copper housing. Furnish shock absorbers as shown on the Drawings. Shock absorbers shall be selected by weight in fixture units as indicated on the Drawings.
   1. Zurn No. 1700, sizes 100 to 600, Wade No. W Series, Josam No. 75000 Series, Watts "SS" Stainless Steel series, or Jay R. Smith No. 5000 Series.

2.08 TRAP SEAL PROTECTION DEVICES

A. Mechanical Trap Primers: Provide fully automatic, all brass trap primers activated by a drop of only 5 psig in building water pressure. Trap primers shall be able to be disassembled and repaired in field, provided with replaceable filter and so indicated on Shop Drawings. Trap primers shall conform to ASSE Standard 1018. Furnish trap primers as shown on the Drawings. Trap primers shall be sized as indicated on the Drawings. Provide distribution units when required. Provide 3/4 inch underfloor slab gravity drain from trap primer to inlet of trap.
   1. MIFAB, Precision Plumbing Products, Wade, or Sioux Chief.

B. Electronic Trap Primers: Provide fully automatic, UL-listed, all brass trap primers activated by a pre-set 24-hour timer and a manual override switch. Provide atmospheric vacuum breaker conforming to ASSE 1001, a single point power connection and a 3/4 inch water connection in a flush-mount 16 gauge steel cabinet. The entire trap primer assembly shall conform to ASSE Standard 1044. Furnish trap primers as shown on the Drawings. Trap primers shall be sized as indicated on the Drawings. Provide distribution units when required. Provide 3/4 inch underfloor slab gravity drain from trap primer to inlet of trap.
   1. MIFAB, Precision Plumbing Products, Wade, or Sioux Chief.

C. Barrier Type Trap Seal Protection Devices: Provide compression-fit inline floor drain barrier-type trap seals with UV-resistant pliable material that allows liquids to pass, but will also create a vapor seal to minimize evaporation rate of the trap water seal. Trap seal devices shall conform to ASSE Standard 1072.
   1. MIFAB, Precision Plumbing Products, RectorSeal, Wade, or JR Smith.

2.09 WATER HEATER EXPANSION TANKS

A. Non-ASME rated steel tank with air charge valve, hot water connection, flexible butyl diaphragm, air precharge, FDA approved or certified for use in potable water service. Provide certification with Shop Drawing.
   1. Amtrol, Watts, State, Bell & Gossett, Zurn, or Wessels Expansion Tanks.

2.10 STRAINERS

A. 1/2 Inch to 4 Inches: Watts No. 777S, "Y" strainer, 125 SWP, bronze body with 20 mesh stainless steel screen, threaded ends. Provide drain valve on strainer with 3/4 inch garden hose threaded outlet and capped.

2.11 INTERIOR HOSE BIBBS

A. Hose bibbs to have ball valves on supply lines and non-removable vacuum breaker spout, chrome finish, 3/4 inch hose end and be furnished as indicated on the Drawings. Inside sill fitting, loose key handle, slow compression cartridge.
   1. Chicago Faucet, Watts, T & S Brass, Nibco, Woodford, or Conbraco.

2.12 EXTERIOR WALL HYDRANTS

A. 3/4 inch freezeresistant hydrant (ANSI/ASSE 1019), cast bronze casing, bronze faucet face, nickel bronze locking box and cover, with integral self-draining vacuum breaker/backflow preventer, length as required. Provide key. All solder connections shall be lead-free.
   1. Jay R. Smith, Zurn, MIFAB, Woodford, Watts, Wade or Josam.

2.13 TEMPERATURE REGULATOR, MIXING VALVE (POINT-OF-USE)

A. Lead free, bronze body, thermostatic, point-of-use thermostatic mixing valve shall conform to ASSE Standards 1070. Provide mixing valve with vandal resistant temperature adjustment cap, stainless steel springs, Buna-N o-rings, and integral check valves on hot and cold inlets.
   1. Leonard, Chicago Faucet, Lawler, Bradley, Acorn, Watts, or Powers.

2.14 RECESSED WALL CONNECTION BOX

A. Provide a white powder coated / galvanized steel box including all components as indicated on the Drawings and Schedule.
   1. Guy Gray, Oatey, Neptune, Water-Tite, or Sioux Chief.

2.15 WATER HEATER DRAIN PAN

A. Provide water heater drain pan and support for water heater. Drain pan shall be a minimum of 2 inches larger all around water heater, 21 inches / 24 inches / 26 inches / 27 inches / 30 inches diameter high density polyethylene with 1" diameter drain outlet.
   1. Benjamin Manufacturing Company, Oatey or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all plumbing specialties per manufacturer's instructions.

B. Locate shock absorbers according to PDI Standard WH-201 and where shown on Drawings. Sizes shown on Drawings. Tag all shock absorbers with size designations for field inspection. Locate shock absorber in an accessible location or provide an access panel. Coordinate exact location of the access panel with the Architect, prior to placement.

C. Install backflow preventers and vacuum breakers as shown on the Drawings. Air gap type drain fittings are to be provided on reduced pressure backflow preventers and pipe to nearest drain.

D. After installation of backflow preventer, flush water supply to remove debris. Clean out backflow preventer after flushing. Test backflow preventers at time of installation. A person or firm certified by the Ohio Department of Health shall perform the test and provide the testing equipment. Submit proper test report to Architect.

E. Provide Y-type strainer with capped drain valve on upstream line to each backflow preventer.

F. Install thermometers on inlet and outlet piping to the water heaters and on domestic hot water recirculating pumps and where shown on Drawings.

G. Install pressure gauges at the water service entrances and on the inlet and outlet piping of all pumps.

H. Install wall hydrants flush and plumb with building wall and 24 inches above finished grade. Confirm exact height and locations with Architect.

I. After installation of mixing valve assembly, flush water supply line to remove debris. Install strainers on upstream lines to inlets on mixing valve.

J. Install continuous back pressure vacuum breaker on all lines to hose bibs if not furnished with integral vacuum breaker.

K. Provide support for backflow preventer when required.

L. Install backflow preventer on water supply line where shown.

M. All products of the same type shall be by the same manufacturer.

N. Install strainer on inlet side of each pressure reducing valve.

O. Extend drain from water pressure relief valve to 2 inches above floor drain.

3.02 COORDINATION

A. Coordinate installation height and location of hose bibbs, faucets, interior and exterior wall hydrants with the Architect.

B. Coordinate location and requirements of recessed wall connection box with Architect, equipment and the Electrical Contractor.

END OF SECTION

SECTION 22 05 23
PLUMBING VALVES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide valves to facilitate maintenance and isolation of piping systems.

B. All valves shall be line size. All valves shall be constructed so that all wetted surfaces contain a weighted average of 0.25 percent lead or less.

C. Provide valve chart. Refer to Section 20 05 20, "Record and Information Manuals."

D. Shut-off valves shall be provided on all branches of main water lines and ahead of dielectric unions.

E. All valves on domestic water system shall have threaded or flanged ends.

F. Valves shall be suitable for use with potable water up for pressures up to 125 psig and temperatures up to 180˚F.

1.02 QUALITY ASSURANCE

A. Standards: American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), National Sanitation Foundation (NSF), American Society for Testing and Materials (ASTM), and the Manufacturers' Standardization Society of the Valve and Fittings Industry (MSS).

B. All cast brass or bronze valves shall be third-party certified to be lead-free per NSF/ANSI-61-8 (Commercial Hot 180°F) and NSF/ANSI-372 when installed in the waterway used for delivering potable water. Submit certification with valve shop drawings.

C. All valves of the same type used on the project shall be by the same manufacturer, except as noted.

D. Brass valves shall be constructed using alloys proven to prevent dezincification when used in the specific plumbing system where they are being installed.

PART 2 PRODUCTS

2.01 BALL VALVES

A. 3 Inches and Smaller: 2-piece, 600 lb. WOG, lead free, cast bronze body, RTPFE seat, hexagonal threaded packing gland, PTFE packing, full port, blow-out proof stainless steel stem, adjustable packing gland, extension shaft for insulation clearance, stainless steel or chrome plated solid bronze ball, threaded ends.

B. Acceptable Manufacturers: Milwaukee Valve, Apollo, Hammond, Powell, Watts, Nibco, or Crane.

2.02 BUTTERFLY VALVES

A. 2 Inches to 12 Inches: 200 lb. WOG, full lug type, ductile iron body, extended neck, EPDM seal, aluminum-bronze disc, stainless steel stem, 6 inches - lever operated, 8 inches and larger - gear operated. Provide lever with lever operated valve.

B. Acceptable Manufacturers: Milwaukee Valve, Apollo, Hammond, Powell, Watts, Nibco, Keystone, Crane, or Mueller.

2.03 GATE VALVES

A. 3 Inches and Smaller: 300 lb. WOG, lead free, solid cast bronze body and wedge, rising or non-rising stem, threaded bonnet, threaded ends, and malleable or ductile iron handwheel.

B. Acceptable Manufacturers: Milwaukee Valve, Hammond, Powell, Watts, Nibco, or Crane.

2.04 GLOBE VALVES

A. 2 Inches and Smaller: 300 lb. WOG, lead free, cast bronze body and disc, brass seat ring, threaded bonnet, non-rising stem, threaded ends, handwheel operator.

B. Acceptable Manufacturers: Milwaukee Valve, Apollo, Hammond, Powell, Watts, Nibco, or Crane.

2.05 CHECK VALVES

A. 2 Inches and Smaller: 200 lb. WOG, lead free, cast bronze body, brass disc, threaded bonnet, and threaded ends.

B. Acceptable Manufacturers: Milwaukee Valve, Hammond, Powell, Watts, Nibco, or Crane.

2.06 DRAIN VALVES

A. Rough bronze body, angle pattern, screwed, boiler drain valves with packing nuts, garden hose thread outlet with bronze cap and chain as manufactured by any of the above listed Manufacturers.

B. 3/4 inch ball valve with garden hose threaded outlet, bronze gasketed cap, and chain by any of the above listed Manufacturers may be used at Contractor's option.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install valves and specialties where indicated on the Drawings or where required for maintenance and service. Install valves with stems horizontal wherever possible, or within 15 degrees of vertical. Install valves with stems in the vertical in piping near the floor.

B. Install 3/4 inch drain valves with hose end and capped in piping at low points to provide complete drainage of all systems.

C. Install valves on hot and cold water branches serving more than one fixture, in supply lines to any equipment not provided with stops and in lines to wall hydrants.

D. Install all valves in accessible locations. Coordinate with ceilings, structure, mechanical and electrical equipment.

E. Provide space to allow adjustment of balancing valve.

F. Install union between each valve and piece of equipment.

G. Install access panels for all valves above inaccessible ceilings and locate in walls or chases. Coordinate panel locations with the General Contractor and Owner's Representative.

H. Install valves on branches to isolate areas of the building.

3.02 PROHIBITIONS

A. Do not install any valves where the fluid operating pressure exceeds 80% of its pressure rating.

3.03 TESTS

A. Test all valves for tightness.

B. Test operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure. Replace or repair leaking valve.

END OF SECTION

SECTION 22 07 01
PLUMBING INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Insulate all domestic cold water supply, hot and tempered water supply, hot water return and make-up water piping, regardless of length or location, and also insulate the following:
   1. Water supply and waste pipe under all fixtures accessible to the handicapped.
   2. Electric water cooler and drinking fountain waste traps and piping to wall.
   3. Above-floor slab traps and horizontal drain lines at least 10 feet downstream of lines that receive chilled water or condensate or to vertical drain line.
   4. All above-floor slab trap primer drain lines to trap inlet.
   5. All direct buried domestic cold water, domestic hot water, and domestic hot water return piping shall be insulated with flexible, closed-cell elastomeric insulation.
   6. All valves in all domestic cold water supply, hot and tempered water supply, hot water return piping.

B. If insulation is damaged while in storage or during installation, replace insulation at no additional cost to the Owner.

1.02 FACTORY-INSULATED EQUIPMENT

A. Water heaters and hot water storage tanks shall be factory-insulated to comply with the State Energy Code and shall comply with Federal Standards HHI-530A.

1.03 QUALITY ASSURANCE

A. Reference standards: National Fire Protection Association (NFPA) and Underwriters' Laboratories (UL).

B. Insulation shall be in accordance with the State Energy Code and provide a maximum allowable heat loss as follows:
   1. Piping: 25 BTUH psf of pipe surface area.

C. Insulation to be installed according to "Commercial and Industrial Insulation Standards," as published by the Midwest Insulation Contractor's Association, latest edition.

1.04 FIRE AND SMOKE HAZARD RATINGS

A. Indoor pipe insulation shall have a flame-spread rating not exceeding 25, a smoke-developed rating not exceeding 50, and a fuel-contributed rating not exceeding 50. All insulation accessories shall have similar ratings. Rates are as tested by procedures ASTM E-84, NFPA 255, and UL 723.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture condensation and physical abuse and to protect from weather.

1.06 MANUFACTURERS

A. Pipe and Roof Sump Insulation
1. Fiberglass: Owens-Corning, Manson, Knauf, or Johns-Manville.
2. Closed Cell Insulation: Armacell "Armaflex," K-Flex, Aeroflex or Nomaco.
3. PVC Insulation Covers: Speed Line, CertainTeed, IMCOA, Knauf, CEEL-CO CEEL-TITE 300 Series, Foster Sealfas, or Zeston.

B. Plumbing fixture drain and angle valves and supply lines under fixtures accessible to the disabled and shall be vandal-resistant, seamless, fire retardant, antimicrobial (germ-fighting additive) (insulation may be preinstalled with P-traps and offset grid drains): Plumberex, McGuire, Truebro, Brocar, EBC, TCI or Sanitary Dash.

PART 2 PRODUCTS

2.01 ADHESIVES, FINISHES AND MASTICS

A. Use the following items or equivalent items:
1. Vapor barrier lap adhesive - Foster Drion Contact Bond Cement 85-75
2. Lagging adhesive - Foster 81-42W
3. Metal bonding adhesive - Foster 85-15
4. Indoor vapor barrier finish - Foster 30-80
5. Indoor breather finish - Foster Lagtone 46-50
6. Outdoor vapor barrier mastic - Foster 46-50
7. "Fuse-Seal" sticks and applicator (for polyolefin insulation)

B. The use of the preceding adhesives, finishes, and mastics shall be approved by the insulation manufacturer. Once dried, these materials shall have a flame-spread rating not exceeding twenty-five (25) and a smoke-developed rating not exceeding fifty (50).

2.02 THERMAL RESISTANCE OF PIPING INSULATION

A. Insulate all piping installed to serve buildings and within buildings in accordance with the minimum pipe insulation as listed in the following table:

Minimum Pipe Insulation based on a conductivity of 0.24 to 0.28 (Btu)(in)/((hr)(cu.ft.)((F)) 100 degree F Mean Rating Temperature

Insulation Thickness for Pipe Sizes (Inches)

Piping System	Fluid Temperature Ranges (°F)	1 1/4" and Less	1 1/2" to 4"	4" to 6"	8" and Larger
DOM hot water, tempered water and hot water return	any	1.0	1.5	1.5	1.5
DOM cold water	40-55	0.5	0.5	1.0	1.0
EWC and DF waste	40-55	--	1.0	--	--
Floor drain p-traps	any	--	1.0	1.0	--

B. The pipe sizes given in the preceding table are nominal dimensions.

2.03 INDOOR PIPING

A. Fiberglass heavy-density insulation with all service vapor membrane jacket and pressure sealing lap adhesive on longitudinal and butt strips, K=0.23 at 75 degrees F, Owens-Corning 25 ASJ/SSL II. Staple and seal with pressure sealing lap adhesive on longitudinal and butt strips. Jacket vapor membrane shall have an installed vapor permeance of not more than 0.09 perms.

B. Polyolefin foam insulation (for service temperature up to 210 degrees F), K=0.24 at 75 degrees F, IMCO "IMCOLOCK" or "IMCOSHIELD." No vapor barrier is necessary with 0.0 perm/inch permeability.

C. Option: A flexible, closed-cell elastomeric insulation with pressure sealing longitudinal joints or applied adhesive meeting ASTM E84's ratings of 25 flame-spread and 50 smoke-developed. Adhesive shall be approved by Insulation Manufacturer.

2.04 EXPOSED INDOOR PIPING UP TO 10 FEET ABOVE NEAREST WALKING SURFACE

A. Insulation same as for indoor piping. Cover with ultraviolet-resistant PVC jacket. Jacket to be self-extinguishing and have zero fuel contribution. PVC jacket shall have a flame-spread rating not exceeding twenty-five (25) and a smoke developed rating not exceeding fifty (50). All piping visible inside and outside mechanical rooms is considered exposed.

2.05 FITTINGS AND VALVES

A. Premolded PVC covers over molded insulation. Insulation same thickness as on adjoining pipe. Insulation shall have a flame-spread rating not exceeding twenty-five (25) and a smoke-developed rating not exceeding fifty (50). For polyolefin insulation, use insulation of same type and thickness as on adjoining pipe.

2.06 PIPE INSULATING SUPPORT

A. Refer to Section 20 05 45, "Hangers, Supports and Inserts." The use of thermal protectors as pipe insulation supports are noted elsewhere in this specification. Where inserts are used, maintain insulation vapor barrier integrity.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION NOTES

A. Installation shall be in accordance with the manufacturer's recommendations.

B. Use no damaged or water-soaked insulation.

C. Insulate all water piping as described above, including piping concealed in walls.

D. Insulation to be continuous through sleeves and hangers.

E. When piping is installed through fire-rated walls and floors, the insulation shall be continuous and fire-rated calking shall be installed between pipe insulation and wall sleeve without any interruption to the vapor barrier.

F. Leave no "raw" ends on fiberglass insulation. Bevel fiberglass insulation terminations seal with insulating cement and cover ends with glass cloth or similar to pipe insulation covering.

G. Ensure that exposed insulation has a neat and finished appearance. Provide sizing for insulation if required and leave ready for painting.

H. Overlap jacket joints and seal with a suitable adhesive. The use of staples is acceptable on domestic hot water systems only, but only as an installation aid and not as a substitute for adhesive.

I. Brush coat all staples with a white vapor-barrier mastic and seal to provide an uninterrupted vapor membrane. Mastic shall be approved for use by the insulation manufacturer.

J. Install all insulation with a continuous, unbroken, and unpunctured factory-applied vapor membrane.

END OF SECTION

SECTION 22 11 16
INTERIOR DOMESTIC WATER PIPING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Connect to the site water service line approximately 5 feet outside building foundation wall as shown on Drawings, extending the water line into building. The Site Utility Contractor shall provide the site water line to the point indicated on the Drawings.

B. Provide a complete system of hot and cold water to fixtures and equipment.

C. Provide a water service backflow preventer. Refer to Drawings.

D. Provide a dedicated 2" water line on the building side of the backflow preventer and pressure reducing valve, with its own shut-off valve for future connection to a Remote Restroom building. Extend this 2" line 5' from the outside building foundation wall.

E. Test and sanitize the complete new domestic water system, isolating any existing water system as much as possible.

1.02 QUALITY ASSURANCE

A. Standards: American Society of Plumbing Engineers (ASPE), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), National Sanitation Foundation (NSF) and Plumbing and Drainage Institute (PDI), Columbus, Ohio Division of Water.

B. Provide only fittings, piping, valves, and solder certified to be lead-free in accordance with EPA and NSF requirements. Submit written certification that all of the installed components meet these requirements.

PART 2 PRODUCTS

2.01 PIPING

A. 4 Inches and Smaller:
   1. Type "L" hard drawn copper tubing (ASTM B88).

B. Piping Below Grade, 2 Inches and Smaller: Type "K" soft temper copper tubing (ASTM B88).

C. The use of PEX piping is prohibited.

2.02 JOINTS AND FITTINGS

A. Copper: Wrought copper socket solder (ANSI B16.22) or brazed (ANSI B31.1) joints.

B. Galvanized Steel: Galvanized cast iron, Class 150 lb. flanged or screwed fittings (ANSI/AWWA C110/A21.10); roll-grooved joints with Grade "E" gasket for use up to 230 degrees F service. Acceptable manufacturers are Victaulic, Gruvlok, and Central.

C. Underground Copper: Wrought copper fittings with brazed joints.

D. Copper Press Fitting Joining System
   1. If permitted by local authorities, copper pipe may be mechanically joined by copper or bronze compression fittings. Fittings shall carry a 50-year manufacturer's warranty.
      a. Use shall be limited to systems with maximum operating pressure of 200 psi, and maximum operating temperature of 210 degrees.
      b. Fittings 1/2 inch to 3 inches shall be crimped on both sides of an integral bead containing an EPDM seal. Fittings 2 1/2 inches through 3 inches shall be double crimped and be fitted with a stainless steel grip ring.
      c. Piping shall be Type "L" copper.
      d. The Contractor shall be trained on the installation of the product by the manufacturer and shall follow the manufacturer's installation instructions.
      e. All valves and specialties must conform to all other requirements of these Specifications.
   2. Material:
      a. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Fittings shall have a feature which allows the installer to quickly and easily identify connections which have not been pressed prior to putting the system into operation.
   3. Acceptable Manufacturers:
      a. Rigid-Viega, Nibco, Apollo, or Anvil

E. Grooved Mechanical Piping System (Stainless Steel Only) / (Stainless Steel and Copper)
   1. Any Contractor who has installed at least five (5) grooved mechanical piping systems may use mechanical grooved couplings and fittings on roll grooved piping of material as indicated above.
   2. Grooved mechanical piping systems shall be installed according to manufacturer's instructions. The manufacturer shall perform on-site installation demonstrations to the installing contractor before grooved coupling installation begins. Installing contractor shall verify that couplings are tightened to manufacturer’s instructions.
   3. Grooved isolation valves, check valves, balance valves, strainers, and specialties are accepted when grooved method is utilized. Isolation valves, check valves, balance valves, strainers, and specialties shall meet the requirements of sections 22 05 02 “Plumbing Specialties” and 22 05 23 “Plumbing Valves.”
   4. Victaulic Manufacturing Co. or Anvil Gruvlok.

2.03 SOLDER AND BRAZING ALLOYS

A. Solder: 95/5 tin-antimony (ASTM B32), (above grade use only), less than 0.2% lead.
   1. "Silvabrite 100" as manufactured by Englelhard or equal.
   2. "Bridgit" as manufactured by J.W. Harris Company or equal.
   3. "Sterling" as manufactured by Tarament or equal.

B. Copper Brazing Alloys: AWS A5.8 Class BCUP-5 alloys having a melting point greater than 1350 degrees F. (ANSI B31.1), less than 0.2% lead.
   1. Sil-Fos filler as manufactured by Handy and Harmon or equal.
   2. Aircosil 15 filler as manufactured by Airco Welding Products or equal.
   3. "Stay-Silv "15" as manufactured by J.W. Harris.

C. No alloys containing 0.2% or more lead shall be used for joints within any portion of the potable water system. No fluxes containing 0.2% or more of lead shall be used in the fabrication of soldered joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all valves in accessible locations and coordinated with access panel locations.

B. Make all joints in strict accordance with the manufacturer's written installation instructions and best practices of the profession.

C. Install water lines located in exterior walls closest to the "heated" side of the wall. Cover the piping with continuous insulation. Pack the space between the insulated pipe and the "unheated" side of the wall with a continuous layer of building insulation.

D. Locate shock absorbers according to PDI Standard WH-201 and where shown on Drawings. Sizes shown on Drawings. Tag all shock absorbers with size designations for field inspection.

E. Provide an approved dielectric break between piping of dissimilar metals; fittings, flanges, transition materials, etc.

F. Install unions or flanges between valves and final connections to all equipment.

G. Use only nipples of the same or similar material as the pipe being connected.

H. Install valves on all branch line, fixture group areas, wall hydrant drops at the wall and at all equipment connection, whether specifically shown on the Drawings or not.

I. Securely anchor all supply piping to fixtures, faucets, hydrants and flush valves to prevent movement.

J. Provide all low points within the potable water systems with drain valves to facilitate drainage. Install system to permit complete drainage of the system.

K. Where piping is installed above ceilings, below ceiling insulation, the Plumbing Contractor shall confirm that ceiling insulation has no insulation voids above piping.

L. Install piping entering the building below grade with a minimum of 5 feet of cover from finished grade.

3.02 COORDINATION

A. Coordinate piping with beams, joints, wall, HVAC piping, ductwork, equipment and electrical equipment and conduit.

B. Coordinate flushing of new site water line and building domestic water lines after sterilization of new domestic water lines with Owner.

C. Coordinate location of main building water supply line within building, above floor slab with Site Utility Contractor.

D. Coordinate location of rough-ins, outlets, and final equipment connections with all other Contractors and Owner's equipment.

3.03 TESTS

A. Perform tests as required by the Local Code Authority and as specified below:
1. Take precautions to remove all air before performing hydrostatic tests.
2. Test piping at 1 1/2 times actual working pressure or 125 psig, whichever is greater, for six (6) hours with no pressure drop. All tests shall be made before piping is concealed.
3. If a leak occurs, defective piece or joint shall be replaced. Caulking is prohibited. Repeat tests until no leaks are detected.
4. Perform all testing after completion of roughing-in, before setting of fixtures.

B. Submit test reports to the Owner.

3.04 STERILIZATION OF WATER LINES

A. The entire domestic water system must be sterilized no more than 20 days prior to whole or any partial occupancy of the building. After the water system is complete and fixtures have been installed, and before whole or partial occupancy of the building, flush piping clean and sterilize all new hot and cold-water piping, including water service line and water heaters. This requirement also includes any existing piping systems that had significant modification as part of the project and any portion of the existing system that had been out of service for more than 20 days. Any delay in occupancy beyond this timeframe shall require additional disinfection and flushing by the Contractor at no cost to the Owner. Sterilize lines under the immediate on-the-job supervision of a Water Testing Laboratory regularly engaged in the service. This Contractor shall pay all fees for testing and use of testing equipment. A written chlorination report shall be submitted to the Owner for his records.

B. With all outlets closed, fill system to working pressure and close valve on supply main.

C. Open all fixtures slightly and pump a sterilization solution into test tap to achieve a minimum of 50 parts per million chlorine solution made from a sanitation grade of hyperchlorite, 70% available chlorine. Hyperchlorites may be Pittchlor, H.T.H. or Perclorn.

D. Test every outlet, hot or cold, during fill to prove the presence of chlorine at that outlet. Chlorine shall be present at all outlets. Measure chlorine level at a minimum of 30% Engineer to review this percentage for each project of the outlet locations distributed throughout the system, but no less than 20 outlets all if less than 20 outlets on the project, including the most remote outlets and on every level of the building to insure total system chlorination.

E. Water piping system shall remain filled for a period of 24 hours. As an alternative, the system may be filled with a 200-parts per million solution of chlorine and allowed to stand for three (3) hours.

F. After sterilizing, all outlets shall be opened wide and the main supply valves opened, flushing system free of chlorine with clean water. Outlets shall be again checked and flushed until free of chlorine. Flush entire system. Coordinate this action with Owner if building is occupied.

G. After final flushing, all electric water cooler strainers, faucet aerators and mixing valve strainers shall be removed, cleaned and reinstalled.

H. Chlorination of the system may be performed at the same time the pressure test is conducted, if it is conducted within the 20-day timeline.

I. After sterilization of system is complete, notify the local Health Department having jurisdiction to obtain water samples and complete biological examination.

J. Obtain Certification of Acceptance from the Health Department and forward to The Architect.

END OF SECTION

SECTION 22 13 01
SANITARY SEWER SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a sanitary sewer system from a point 5 feet from building extending and connect to new sanitary sewer as shown on Drawings.

B. Provide and install new piping, concrete manhole(s) and cleanouts at location(s) indicated on Drawing.

C. Test complete new system.

1.02 QUALITY ASSURANCE

A. National Agencies: American Society of Testing and Materials (ASTM), National Clay Pipe Institute (NCPI), American Concrete Pipe Association (ACPA), Cast Iron Soil Pipe Institute (CISPI) and American Water Works Association (AWWA).

B. The following local agencies:
1. State Environmental Protection Agency
2. Occupational Safety and Health Administration (for ladders).
3. State Department of Transportation
4. City Sewer Department

C. Installation shall meet State and Local requirements.

1.03 CONCRETE WORK

A. Unless otherwise noted, all cast-in-place concrete for the plumbing work shall be by the General Trades / Plumbing Contractor.

B. Unless otherwise noted, all concrete material and installation shall be as required in Division 3 of the Specifications.

1.04 MANUFACTURERS

A. Non-Reinforced and Reinforced 12 inches + Concrete Sewer Pipe: North Star, Price Brothers, or approved equal.

B. Vitreous Clay Sewer Pipe: Logan Clay Products Company or approved equal.

C. Cast Iron Pipe: Griffin, Clow, American Cast Iron, Richmond Foundry, U.S. Pipe, Tyler Pipe, or Charlotte Pipe.

D. Ductile Cast Iron Pipe: Griffin, Clow "Super Bell-Tite," U.S. Pipe "Tyton Joint," or American Cast Iron.

E. PVC Plastic Pipe: Manville, Certain-Teed, JMR-T, Capco, Yardly or Charlotte.

F. Plastic Pressure Pipe: Manville "Blue Brute," North Star "Aqua-Lite," Certain-Teed or Robin Tech.

G. Cleanouts: Zurn, Wade, J.R. Smith, Josam or Watts.

H. Precast Concrete Manholes: E.C. Babbert, North Star, Price Brothers, Mack Industries, Reliance Universal or approved equal.

1.05 COMPLETION

A. Upon their completion, sewers, manholes, cleanouts, and grease interceptors are to be left clean and free from rubbish until the acceptance of the work.
   1. Repairs or alterations made to the manholes and the grease interceptor after performing the leakage test may be justification for a retest of the section of sewer involved.

PART 2 PRODUCTS

2.01 SEWER PIPE

A. Under roadways, driveways and parking areas or where final cover over sewer is less than 3 feet or more than 12 feet use the following:
   1. Service weight cast iron soil pipe and fittings for sizes through 15 inches: Bell and spigot type conforming to ASTM A74 with compression gasket joints.
   2. Extra strength vitrified clay sewer pipe (ASTM C700), with (ASTM C425) rubber or plastic ring gaskets, and poured 8 inch thick concrete all around.
   3. Reinforced concrete sewer pipe for sizes 12 inches and larger Class IV, conforming to ASTM C76 or equivalent. Design and construction of pipes shall meet minimum Class 3 strength requirements or equivalent sufficient to obtain 0.01 inch crack and ultimate D load of 2,000 lbs., ASTM C443 rubber gaskets.

B. Under sodded areas or non-traffic areas, use the following:
   1. Non-Reinforced concrete sewer pipe (up to 10 inches), reinforced concrete sewer pipe Class III, 12 inches to 24 inches and Class II for 24 inches and larger ASTM C76 with ASTM C443 joints.
   2. Extra strength vitrified clay sewer pipe bell and spigot ASTM C700 with rubber or plastic ring gasket joints conforming to ASTM C425.
   3. Hubless cast iron pipe (CISPI-301) with "No-Hub" couplings.
   4. Service weight cast iron bell and spigot type pipe ASTM A74 with ASTM C564 compression seal gasket joints.
   5. PVC plastic sewer pipe (ASTM/ANSI D3034), Type PSM, SDR 35 with (ASTM D3212) flexible elastomeric seals.
      a. Contractor shall install pipe per ANSI/ASTM 2321 - "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe," and ANSI/ASTM D3221.

C. Cast iron pipe and fittings shall have factory-applied coating with enamel (ASTM A-74) and must be OEPA acceptable.

2.02 FITTINGS

A. All fittings shall be of the same type and class of material as the pipe or of materials having equal or superior physical and chemical properties.

B. Fittings shall be molded or formed to suit pipe size and end design, in required tees, bends, elbows, cleanouts, reducers, and other configurations required.

2.03 JOINTS

A. Joints for Cast Iron Soil Pipe:
   1. Rubber gasket compression type joint conforming to ASTM C564 shall be "dual-tight" or "Ty Seal" with lubricant equal to "Lubrifast."
   2. "No-Hub" couplings (CISPI-310-90) with neoprene sleeve and heavy duty Type 304 stainless steel collars and a minimum of four (4) stainless steel clamps. ANCO "Husky," "Clamp-All," Mission or Mage. Option: Cast iron coupling equal to ALFA, MG or Gustin-Bacon couplings.

B. Joints for Concrete Pipe:
   1. Tongue and grooved compression type "O" ring gasket constructed of chloroprene conforming to ASTM C443.

C. Joints for Vitrified Clay Pipe:
   1. Compression type, rubber ring gasket conforming to ANSI/ASTM C425.

D. Joints for Plastic Pipe:
   1. ASTM D3212, bell and spigot style, flexible elastomeric seals.

2.04 MANHOLES

A. Furnish manhole as required by the following Standards:
   1. ODOT Standard
      a. No. MH-3, Precast Manhole
      b. No. MH-1, Field Constructed Manhole
      c. No. MH-2, Drop Manhole
   2. City of Columbus, Division of Sewerage & Drainage Standard
      a. No. S102, Precast Manhole
      b. No. S100, Field Constructed Manhole
      c. No. S110, Drop Manhole
   3. State and Local Requirements

B. Precast Manhole Construction:
   1. All precast manholes exceeding 6 feet in depth shall be of an eccentric design.
   2. The walls shall be corbelled in at the top to receive heavy duty frame and cover conforming to Local Code Standards.
   3. Rungs of plastic coated 3/4 inch mild steel bars shall be built into walls 12 inches to 16 inches maximum spacing on centers to form a ladder.
   4. Interior bottom shall be left clean and free of all debris.

5. Precast concrete manholes shall be constructed to meet all requirements of Governing Agency and approved by Local Code Authorities, but must have eccentric top with straight walls to bottom of steps.
6. Precast concrete manholes and eccentric cone top sections shall be in accordance with ASTM C478 with ASTM C443 joints.

C. Manhole Covers:
1. Best quality soft gray iron castings (ASTM A48), sound and true to pattern, with removable solid or grated cover, "roadway" weight, coated with two (2) coats of varnish at factory. "Sanitary" cast mark on lid shall identify service. Refer to Drawings for size and type manhole covers.
2. Conform to Local Code Requirements.
3. Neenah, McKinley, Vulcan or East Jordan.

2.05 EXTERIOR CLEANOUTS

A. General: All cleanouts shall be vandal resistant covers and be line size up to including 4 inches.

B. Refer to schedule on Drawings for specific types and accessories.

C. Zurn, Wade, J.R. Smith, Watts or Josam.

PART 3 EXECUTION

3.01 SITE INSPECTION

A. Contractor must examine the areas and the conditions under which sanitary sewer system work is to be installed and notify the Architect of conditions detrimental to the proper and timely completion or the work.

B. Existing lines may not be taken out of service unless approved by the Architect or Owner.

C. Notify the Architect and Owner for approval, at least 48 hours in advance of the desired time for taking any line out of service.

D. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

E. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION OF SEWER LINE

A. General:
1. Install pipe, fittings and accessories, in accordance with manufacturer's requirements and requirements of the Local Code Authority, except where more stringent requirements are required by these Specifications.
2. Inspect piping before installation to detect any apparent defects. Mark defective materials with white paint and promptly remove from the site.

3. Lay piping beginning at the low point of a system, true to the elevation and alignment indicated, with unbroken continuity of invert.
4. Place groove or bell end of pipe facing upstream.
5. Install gaskets in accordance with the manufacturer's recommendations for use of lubricants, cements and other special installation requirements. Seal joints watertight.
6. Where minimum cover of sewer pipe during construction or proposed cover over the top of the pipe is 30 inches or less, for sizes 6 inches to 27 inches in diameter inclusive, pipe shall be encased in 8 inches of concrete all around.
7. Concrete Pipe: Install in accordance with applicable provisions of the American Concrete Pipe Association "Concrete Pipe Field Manual," unless otherwise noted.
8. Vitrified Clay Pipe: Install in accordance with applicable provisions of ASTM C12, "Recommended Practice for Installing Clay Sewer Pipe," unless otherwise indicated.
9. Cast Iron Soil Pipe: Install in accordance with applicable provisions of "Cast Iron Soil Pipe and Fittings Handbook" published by Cast Iron Soil Pipe Institute.
10. Plastic Pipe: Install in accordance with applicable provisions of ANSI/ASTM 2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe," ANSI/ASTM D3221, and Manufacturer's Recommendations at the elevation, depth and slope indicated on Drawings.
11. All plastic sewer pipe stored outside shall be covered until installed per Manufacturer's recommendations.
12. Contractor shall provide and install construction stakes, lines and grades or any other items necessary for the installation of the sewer line.
13. Provide all necessary adapters, fittings and pipe required to make connections to existing sewer lines and manholes.
14. Hand trim excavation to required elevations. Correct over excavation with fill material of fine aggregate.
15. Remove large stones or other hand matter which could damage pipe or impede consistent backfilling or compaction.
16. Bed and backfill pipe as specified and per Code.
17. Lay pipe to slope gradient noted on Drawings.
18. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.
19. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end joint of the previously laid length shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close fitting joint.
20. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.
21. Where existing pipe is to be extended, the same type of pipe shall be used unless otherwise specified or directed.
22. Only full lengths of pipe are to be used in the installation, except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.
23. All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.
24. The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over the adjacent to any pipe shall be done at the Contractor's risk.

25. At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.
26. Protect pipe and aggregate cover from damage or displacement until backfilling operation in progress.
27. When crossing above water lines, install pressurized sewer line a minimum of 10 feet on each side of water line.
28. Existing lines may not be taken out of service unless approved by the Architect and Owner.
29. Notify the Architect and Owner for approval, at least 48 hours in advance of the desired time for taking any line out of service.
30. Forced Mains:
    a. Provide all necessary special fittings and clamps for anchorage, rods, piers, bases, anchors, and thrust blocking at all bends, offsets, tees, dead ends, and connection transitions. Protect rods, clamps and bolting with a bituminous coating.
    b. Securely anchor each mechanical joint, tee, plug, caps and bends using pipe clamps, tie-rods and concrete thrust blocks conforming to the requirements of the Authorities Having Jurisdiction.

B. Cleaning:
1. Clear the interior of all pipe of dirt and other superfluous material. Maintain a swab or drag in the line and pull past each joint as it is completed.
2. Place plugs in the ends of uncompleted pipe at the end of the day or whenever work stops.
3. Flush new and existing lines if required to remove collected debris.
4. Sewer pipe, manholes, cleanouts and grease interceptor upon their completion, are to be left clean and free from rubbish until acceptance.

C. Inspection:
1. Inspect pipe to determine whether line displacement or other damage has occurred.
2. Make inspections after lines between manhole locations have been installed and approximately 2 feet of backfill is in place and at completion of the project.
3. If the inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct these deficiencies; coordinate with Architect.

D. Backfill Requirements:
1. Under pavements and sidewalks and future enclosed walkway; backfill with excavated material in 8 inch lifts compacted to 95% ASTM D698.
2. Lawn areas; backfill with excavated material in 12 inch lifts compacted to 90% ASTM D698.

3.03 PRECAST MANHOLE CONSTRUCTION

A. Unless otherwise noted in State or Municipal Standards, precast manholes shall be installed as follows:
1. Place precast concrete sections as required. Where manholes occur in pavements, set tops of frames and covers flush with finish surface, unless otherwise indicated. Top 12 inches of manhole structure may be constructed of brick.

2. Use epoxy bonding compound where manhole steps are mortared into manhole walls.
3. Install rubber joint gaskets complying with ASTM C443.
4. Manhole steps vertical spacing to be 12 inches with a horizontal projection of 7 inches.
5. Form bottom of excavation clean and smooth to correct elevation.
6. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
7. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
8. Mount lid and frame level in grout, secured to top cone section to elevation indicated on Drawings.

B. The walls shall be corbelled in at the top to receive heavy duty frame and cover, and conforming to local standards. Ladder side of manhole walls shall have a straight wall to bottom of steps and steps meet "OSHA" requirements.

C. Where it is necessary to provide drop manholes, drop shall be made adjacent to and outside of the manhole and pipe encased in concrete, or supported in an approved manner.

D. The base channels shall be built with concrete and lined with split pipe or brick, except the curve portion may be formed with concrete.

3.04 INSTALLATION OF EXTERIOR CLEANOUTS

A. Cleanouts to be installed in center of 24 inch square concrete slab, 4 inches thick. Install cleanout and slab flush with grade or pavement.

B. Concrete to be installed by the General Trades / this Contractor.

3.05 COORDINATION

A. Coordinate locations and installation of manholes and cleanouts with the General Trades Contractor.

3.06 TESTING

A. Perform testing of complete, new sanitary sewer system in accordance with requirements of the Local Code Authority.

B. All tests shall be performed before any piping is covered or concealed.

C. A written record of tests shall be submitted to the Architect.

D. Isolate existing system as much as possible during test.

E. Leakage Tests: Leakage through the joints of all sanitary sewer pipes shall not exceed the following allowable limits: 200 gallons per inch of tributary pipe diameter per 24 hours per mile of length or the computed equivalent for shorter lengths and shorter periods of time. Test all sanitary sewers.

F. Infiltration Test: This test is to be conducted when the height of ground water table is 2 feet or move above the elevation of the inside crown of pipe at the upstream limit of the section being tested. The infiltration test shall be made by installing a weir or other measuring device approved by the Engineer in the lower end of the sewer section to be tested. The quantity of ground water infiltration into the sewer shall be measured and shall not exceed the allowable leakage.

G. Exfiltration Test: This test is to be conducted when the height of the ground water table is less than 2 feet above the elevation of the inside crown of pipe at the upstream limit of the section being tested.
   1. In general, a test section shall include the distance between the first manhole, grease interceptor and a downstream manhole. Should the test section fail the exfiltration test, the entire system installed shall be tested, either grease interceptor to manhole or as a whole as directed by the Engineer. The inlet end of the upstream manhole, grease interceptor and downstream manhole shall be closed with a watertight bulkhead and the sewer, along with the upstream manhole, grease interceptor, shall be filled with water until the elevation of the water in the upstream manhole, grease interceptor is 2 feet higher than the inside crown of the pipe in the section being tested, or two feet above the existing ground water in the trench whichever is the higher elevation. The length of section to be tested may be filled and maintained full of water for a period of approximately 24 hours prior to the start of the test. If the water level in the upper manhole has dropped during this 24 hour period, the level shall be raised to the test elevation mark prior to the measurement of leakage. If the Contractor elects to test at any time during the 24 hour period, the water shall be set at the test elevation mark and the test made.
   2. The exfiltration will be determined by measuring the volume of water that is required to be added to return the surface of the water in the upstream grease interceptor to the test elevation mark. The test period shall be a minimum of one hour duration from the start of the test.
   3. The Engineer, because of adjacent trench material consideration, may order that after the completion of the exfiltration test, the test section of line shall be drained and the infiltration, under existing ground conditions, shall be measured within three (3) hours by means of a weir located in the downstream manhole.
   4. The allowable leakage is based on maximum difference in elevation of 8 feet between the level of water in the upper grease interceptor and the invert of the bulkheaded pipe at the downstream manhole. If the difference in elevation exceeds eight feet, the allowable leakage shall be increased 5% for each 1 foot in excess of 8 feet.

H. Air Test: In lieu of exfiltration tests required for pipe sizes 8 inches through 24 inches and subject to approval of the Engineer, the Contractor may request an air test of checking tightness of sanitary sewer pipe construction.
   1. Selected sections or sections of pipe between manholes shall be tested. The selection of sections to be tested are subject to approval of the Engineer. Manholes shall be tested by plugging connecting pipe and filling with water to 2 feet from the crown of the highest entering pipe. After the filled manhole has been allowed to stand for 24 hours, no loss of water will be permitted in a four hour period.
   2. Air testing of pipes will be accomplished only by use of equipment that has been approved by the Engineer and in accordance with the following steps:
      a. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

b. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
c. After an internal pressure of 4.0 psig is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
d. When pressure decreases to 3.5 psig, start stop-watch. Determine the time in seconds that is required for the internal air pressure to reach 2 psig. Minimum permissible pressure holding time for runs of single pipe diameter and for systems of 4 inch, 6 inch, or 8 inch laterals in combination with trunk lines shall be as published in tables by the National Clay Pipe Institute.

3. In the event the allowable leakage limits are not met, the Contractor shall determine the location where excess water is entering or leaving the sewer. The sewer and/or manholes shall be repaired in a manner satisfactory to the Engineer and retested until the leakage is within the allowable limits.
4. The Contractor shall include, in the bid price the cost of all bulkheads, plugs, pipe stopper, pumps, compressors, water, weirs, labor, delay, and any other items of cost necessary for the performance and completion of the required leakage test and for the cost of any repairs or adjustments which may be necessary to make the project conform to the required allowable leakage limits.
5. All leakage tests shall be conducted under the supervision of the Architect/Engineer or his/her representative.

END OF SECTION

SECTION 22 13 16
INTERIOR SANITARY WASTE AND VENT PIPING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a complete system of soil, waste, and vent piping to fixtures and equipment, including traps, floor drains and cleanouts, extending to a point 5 feet outside building wall. Connect to site sanitary sewer system.

B. Site sanitary sewer system provided by the this / General Trades / Site Utility Contractor.

C. Refer to Drawings for size of connections to fixtures.

D. Test complete new system.

1.02 QUALITY ASSURANCE

A. Standards: American Society for Testing and Materials (ASTM) and the Cast Iron Soil Pipe Institute (CISPI), American Water Works Association (AWWA), American Society of Mechanical Engineers (ASME), and American National Standard Institute (ANSI).

B. All pipe and fittings shall conform to the requirements of Commercial Standard CS188.

C. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and listed by NSF International.

1.03 MANUFACTURERS

A. Piping:
1. Cast Iron: Charlotte Pipe & Foundry or Tyler Pipe, American Brass and Iron (AB&I)
2. Copper: American Brass Company, Revere, Chase Brass Company or Nibco.
3. PVC Plastic: Charlotte, Nibco, Manville, Yardley, Freedom or Cresline.

B. Drains and Cleanouts: Zurn, Wade, Jay R. Smith, MIFAB, Watts or Josam.

C. Trench Drains: Josam, Zurn, Polydrain, Polycast, Jay R. Smith "Enviro-Flo" or Aco "Enviro Flow" Model 9818.

PART 2 PRODUCTS

2.01 PIPING

A. Piping and fittings in earth under slab:
1. Service weight cast iron soil pipe and fittings (ASTM A74), factory enamel coated.
2. Copper/DWV (ASTM B306) pipe.
3. Schedule 40 PVC (ASTM D1785 and ASTM D2665), solid wall plastic pipe.
4. Hubless cast iron (CISPI-301), factory enamel coated.

B. Interior Piping and Fittings Above Slab:
   1. Hubless cast iron (CISPI-301), factory enamel coated.
   2. Service weight cast iron (ASTM A74), factory enamel coated.
   3. Copper/DWV (ASTM B306).
   4. Schedule 40 PVC (ASTM D1785 and ASTM D2665), solid wall plastic pipe.

C. Vent Piping and Fittings:
   1. Hubless cast iron (CISPI-301).
   2. Service weight cast iron (ASTM A74).
   3. Copper/DWV (ASTM B306).
   4. Schedule 40 PVC (ASTM D2665).

D. All cast iron piping and fittings shall have factory-applied coatings and be E.P.A. acceptable.

E. All fittings shall be drainage type and be same manufacturer as piping and be compatible with piping for size, material, and joint type.

F. Sump Pump / Sewage Ejector Discharge Piping:
   1. 4 Inches and Smaller: Standard weight, galvanized steel (ASTM 120, Type "F") with galvanized cast iron screwed drainage fittings, shall be used to the point of connection to a gravity line.

2.02 JOINTS

A. Cast Iron Piping:
   1. Compression type plastic or rubber gaskets (ASTM C564) by Dual-Tight or Ty Seal with lubricant equal to "Lubrifast."
   2. "No-Hub" coupling with ASTM C-564 neoprene sealing sleeve, minimum of 28 gauge (0.016 inch) thick heavy duty slotted or corrugated Type 304 stainless steel shield with a minimum of two (2) stainless steel bands on pipe sizes 1 1/2 inch to 4 inches, minimum of four (4) bands on pipe sizes 5 inches to 10 inches. Joints in hubless cast iron pipe sizes 1 1/2 inch to 2 inches where exposure to head pressure cannot exceed 10 foot head shall be approved by CISPI Standard 310-85. Pipe sizes 2 1/2 inches to 10 inches shall be Clamp-All Model #80. Approved manufacturers: Anaco "Husky," Mission or Charlotte Heavy Duty.
   3. Provide external restraints on all piping over 4 inches in size at all changes in direction and all changes in pipe size of two sizes or more. Restraints shall be rated for 500 feet of head pressure.

B. Copper DWV Piping:
   1. Cast brass solder type (ASTM B-584). No soldering or brazing alloys containing lead shall be used.

C. PVC Plastic Piping:
   1. Solvent and cements as recommended by the pipe and fittings manufacturer.

2.03 FLOOR DRAINS

A. General Construction: Drains to be adjustable, coated cast iron double drainage pattern, bottom outlet, flashing clamp, strainers, sediment buckets and trap primer inlets where required and other accessories and features indicated on the Schedule on the Drawings.

B. Each floor drain, other than a light duty rating, shall have an ANSI load rating and be so indicated on the Shop Drawings. If rating is not indicated on Shop Drawings, they will be rejected.

C. Provide membrane clamps on all floor drains in floors having waterproof membrane.

D. Slot in grates shall be free of flashing (clean cut), and tops shall not have sharp edges which may be injurious to bare feet when used in shower or swimming pool areas.

E. Refer to Schedule on the Drawings for specific types and accessories.

2.04 CLEANOUTS

A. General Construction: Floor cleanouts shall be adjustable with flashing clamp and other accessories and features indicated on the Schedule on the Drawings.

B. General: All cleanouts to be line size up to and including 4 inches and installed in accessible locations.

C. Each floor cleanout other than a light duty rating, shall have an ANSI load rating and be so indicated on the Shop Drawings. If rating is not indicated on Shop Drawings, they will be rejected.

D. Provide membrane clamps on all cleanouts in floors having waterproofing membranes.

E. Refer to Schedule on the Drawings for specific types and accessories.

2.05 TRAPS

A. Same material as piping.

B. Refer to Section 22 42 01, "Plumbing Fixtures" for fixture traps, exception, floor mounted fixtures.

2.06 SOLDER AND BRAZING ALLOYS

A. Solder: 95/5 tin-antimony (ASTM B32).

B. Copper Brazing Alloys: Silver/phosphorous or silver/zinc alloys having a melting point greater than 1,000 degrees F.
   1. Sil-Fos filler as manufactured by Handy Harmon.

2.07 VENT FLASHING

A. 8 ounce copper (ASTM B152) flashing or per roof manufacturer's requirements.

B. Ultra-violet light and ozone resistant, flexible weather resistant E.D.P.M pipe flashing with ribbed aluminum base.
   1. Pate, Vent Products, Swarthwout, Shipman or Thy-Curb.

2.08 VANDALPROOF VENT CAPS

A. Zurn Model Z-193, cast iron with vandal-resistant fastening device.
   1. Stoneman, Wade, Jay R. Smith, Watts or Josam.
   2. : Zurn, Neenah, Quazite (Polycast), ABT, Inc. (Polydrain), or approved equal.

2.09 BACKWATER VALVES

A. Zurn Z-1090, cast iron body, no-hub inlet and outlet, gasketed bolted cover, automatic ABS valve seat and flapper.
   1. Wade, Jay R. Smith, Watts or Josam.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Install all underfloor sanitary piping per manufacturer's recommendations and those of ASTM F1668. Trench width shall be the pipe diameter plus 16 inches or 1.25 times pipe diameter plus 12 additional inches, whichever is greater. Provide a minimum of 4 inches of firm, compacted pipe bedding in the bottom of the trench. Pipe shall be laid on bottom of trench with proper pitch to provide proper drainage. Blocking or propping up pipe with wood, rock, or other materials is prohibited. Installed pipe shall be surrounded with aggregate material along both sides of pipe to trench wall. Additional back filling over buried pipe shall be accomplished in 6 inch layers compacting each layer prior to adding additional backfill material. Trench shall be completely filled to the aggregate sub base. Do not drive over buried piping and trench with construction equipment.

B. All plastic sanitary waste and vent piping in return air plenums required to be insulated, shall be insulated with pipe insulation meeting the requirements for return air plenums.

C. Pitch soil and waste piping no less than 1/8 inch per foot, for pipes 2 inches and smaller, pitch at 1/4 inch per foot. Pitch kitchen piping at 1/4 inch per foot from the grease interceptor to sanitary inlet piping.

D. Minimum size is 2 inches for underground waste and vent piping.

E. Install P-trap below floor for floor drains, floor sinks, janitor receptors, showers, standpipes, bathtubs, and hub drains.

F. All changes of directions shall be made with TY or Y fittings and 1/8 bends as required.

G. All pipe joints shall be compatible with piping for size, material and joint types.

H. Provide all necessary adapters, fittings, and pipe required to make connections to site utility piping and to new and existing building sewer and drains.

I. All piping shall be concealed, unless indicated on Drawings.

J. Any horizontal sanitary piping located in elevator equipment rooms shall be covered and enclosed by a painted metal enclosure to prevent water dripping onto equipment.

K. Vertical stacks shall be supported by riser clamps at each floor and concealed when passing through finished areas, unless noted otherwise.

3.02 VENTS

A. Install vents through roof as follows:
1. 3 inches minimum size.
2. Locate at least 8 feet away from outside wall of building and 15 feet away from outside air intakes or operable windows.
3. Offset vent piping below roof to allow for thermal expansion and contraction, minimum 4 foot offset.
4. Vents to extend 12 inches above roof, except where specifically required to be higher or lower by code.
5. Plumbing Contractor cuts hole(s) in roof. Install vent through roof vent boot or sleeve in membrane or metal roof. Roof vent boots furnished and installed by General Trades Contractor. General Trades Contractor to flash vents into roof construction and make watertight. For standing seam metal roof or membrane roof.
6. Coordinate vent locations through roofs with General Trades Contractor, HVAC Contractor and Architect.

B. Connect to existing vents where shown on Drawings.

C. Pitch vents for proper drainage.

3.03 FLOOR DRAINS AND CLEANOUTS

A. This Contractor is responsible for installing top of floor drains and cleanouts flush and level with wall or finished floor. If not shown on Architectural Drawings, confirm elevation and proper floor pitch to floor drains and floor cleanouts with Architect before roughing in. All items not installed flush and level will be removed and replaced by this Contractor at no cost to the Owner.

B. Use graphite on all cleanout plug threads.

C. Install duct tape over floor drains and cleanout covers to provide protection from scratching and collection of dirt and debris during construction. Remove tape just prior to final inspection.

D. Install wall cleanouts at the base of all stacks at 18 inches above finished floor.

E. Install coverplates for all cleanouts in finished areas.

F. Provide exposed cleanout plugs without coverplate in unfinished areas or in above ceiling installations.

G. Exterior: Install in center of 24 inch square concrete slab, 6 inches thick flush with grade or pavement. Concrete shall be installed by General Trades / Plumbing Contractor.

H. All floor drain interiors shall be clean just prior to final inspection.

I. Install floor drains and cleanouts in accessible locations.

J. Install tops of hub drains flush with finished floor.

3.04 COORDINATION

A. Coordinate piping with beams, joists, foundation piers and walls and footings, HVAC piping and ductwork, equipment, electrical equipment, wiring, and installation with conduit, crane and crane rails.

B. Coordinate vents through roof, floor and hub drain and cleanout locations and elevations and installation with walls, equipment and housekeeping pads with the General Trades Contractor and other Contractors.

C. Coordinate location and elevation of new site sanitary sewer.

3.05 TESTS

A. Test entire new sanitary system as required by the Local Code Authority.

B. For a minimum test, plug piping and fill with water to highest vent on roof to provide a minimum of 10 foot of head of water on all parts of the system. Maintain for one hour with no leakage. Repair any deficiencies. Final test to be conducted with smoke or peppermint at 1 inch W.C. for fifteen (15) minutes. Install gaskets or reset fixtures with new gaskets as required.

C. All tests to be performed before any piping is covered or concealed and a written record of the test shall be submitted to the Architect's Representative as a part of the Owner's Record and Information Manuals.

D. Should leaks occur, the defective section(s) of pipe and/or defective fitting(s) shall be removed and replaced with new materials at no cost to Owner.

E. Tests shall be repeated until no leaks occur.

END OF SECTION

SECTION 22 33 37
TANK TYPE WATER HEATERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide electric storage tank water heater complete with heating elements and controls.

1.02 QUALITY ASSURANCE

A. Standards: American Society of Mechanical Engineers (ASME), National Board of Boiler and Unfired Pressure Vessel Inspectors (NB), Underwriters' Laboratories (UL), National Sanitation Foundation (NSF) Gas Appliance Manufacturer's Association (GAMA) and American Gas Association (AGA).

1.03 RATINGS AND CAPACITIES

A. Refer to the Drawings for dimensions, recovery, storage capacity, input and output operating parameters.

1.04 ENERGY CODE

A. Heater shall comply with the latest edition of the State Energy Code.

1.05 GUARANTEE

A. Heater shall have a minimum of three (3) year warranty for commercial use.

1.06 MANUFACTURERS

A. A.O. Smith, Lochinvar, Rheem/Ruud, Reco, Hubbell, State, PVI or Bradford White.

PART 2 PRODUCTS

2.01 ELECTRIC WATER HEATER

A. Tank: UL-listed, 125 lb. / 150 lb. W.P., glass lined tank, anode rod, integral thermostat, baked enamel jacket with factory installed insulation, stainless steel dip tube. Cement tank linings are prohibited.

B. Heating Elements: Low, Medium watt density, zinc-plated copper, sheath, element. Provide low watt density heating elements when in a hard water area.

C. Controls: Element thermostats.

D. Safeties: Element high temperature cutoffs, low water cutoff, and ASME temperature and pressure relief valve.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make all piping connections to water heater.

B. Install gate or ball and drain valves. Install approved T&P relief valve and extend drain line full-size to 6 inches above floor adjacent to floor drain.

C. Power wiring for water heater by the Electrical Contractor.

D. Install thermometer on outlet of water heater.

END OF SECTION

SECTION 22 42 01
PLUMBING FIXTURES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide new plumbing fixtures installed in place, complete with carrier supports, supply and waste trim as indicated on the Drawings.

B. Provide trim, fittings, carriers, stops, chrome water supply piping and all accessories required for a complete installation.

C. Fixture connection sizes are shown on Drawings.

1.02 QUALITY ASSURANCE

A. Standards: American National Standards Institute (ANSI A112.19 and Z124), American Society of Sanitary Engineering (ASSE), National Sanitation Foundation (NSF), Plumbing and Drainage Institute (PDI), city and state plumbing and energy codes.

B. Unless otherwise noted, all fixtures of the same type shall be by the same manufacturer.

C. Upon completion of the project and during final walk through, the contractor shall include the removal and installation of one (1) water closet in the presence of designated AE and Owner personnel to verify proper installation. If found installation is deficient the contractor will be required to remove and reinstall all water closets at no cost to the project.

D. Exposed metal parts shall be chrome-plated unless otherwise noted. Fixtures and trim shall be free of defects. Provide white vitreous china or enamel fixtures, unless otherwise noted.

E. Electric water cooler components that come in contact with the potable water system shall be lead-free per the Safe Drinking Water Act Amendments of 1986, comply with NSF 61, and have CFC-free refrigerant.

F. All faucets shall meet or exceed NSF 61, Section 9 drinking water standard and be so indicated on shop drawings or they will be rejected.

1.03 SUBMITTALS

A. Submit manufacturer's product data for all products specified in this section and shown on Drawings.

B. Shop Drawings: Each submittal shall be clearly marked with fixture designation number, model number, and indicate all required fittings, construction, color and rough-in requirements. Submit color charts when required.

C. The approved fixture's shop drawings shall be a part of the Owner's Manual.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protection: Fixtures and trim shall remain crated and stored until installation to prevent moisture and dirt contamination and physical damage. Adequately protect installed fixtures from damage.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES AND ACCESSORIES

A. Refer to the Specifications and Drawings for specific catalog numbers and required fittings.

B. Fixture Manufacturers:
1. Vitreous China Fixtures: American Standard, Sloan, Kohler, ToTo, or Zurn.
2. Stainless Steel Sinks: Elkay, Just Mfg. Co., CECO, Moen, American Standard, or Kohler.
3. Electric Water Coolers, Drinking Fountains, bottle fillers: Oasis, Haws, Elkay, Sunroc, or Halsey-Taylor.
4. Janitor's Receptor: Fiat, Stern-Williams, Creative Industries, or Mustee.
5. Kitchenette Disposer: In-Sink-Erator, KitchenAid, Waste King, or Whirlaway.

C. Fittings Manufacturers:
1. Flush Valves: Sloan, American Standard, Chicago, Zurn, Kohler, Delany, or ToTo.
2. Water Closet Seats: Bemis, Olsonite, Beneke, or Church.
3. Faucets: Chicago, Zurn, T&S Brass, Watersaver, American Standard, Symmons, Eljer, Speakman, Moen, or Kohler.
4. Automatic Flush Valves: Sloan, Chicago, Zurn, American Standard, Kohler, Hydrotek, Josam-Stern, Delany, or ToTo with vandal-resistant stop cap cover.
5. Automatic Faucets: Chicago, Zurn, Bradley, Sloan, Speakman, T&S, ToTo, or American Standard.
6. Supplies and Stops: McGuire Mfg. Co., Central Brass, EBC, Dearborn, Bridgeport, Speedflex, T & S Brass, Chicago Faucet, Consolidated, Frost, Waterway, Sanitary Dash, Speedway, or Brass Craft.
7. Fixture Traps: McGuire Mfg. Co., EBC, or Central Brass.

D. All trim and exposed piping to be chrome-plated unless noted otherwise.

E. Wall mounted water closets shall utilize neoprene sealing gaskets. Wax gaskets are prohibited.

F. All flush valves shall be provided with vandal-resistant supply stop cap covers, solder adapters, chrome supply tube covers, chrome escutcheon flange, and seat bumpers.

G. All water rough-ins to fixtures shall be securely anchored within wall cavity or chase prior to being stubbed through wall.

H. Faucets to have ceramic disc cartridges or shall be supplied with renewable seats.

I. All mechanical and electronic metering faucets shall have integral check valves.

J. All public restroom faucets and public utilization fixtures shall be provided with thermostatic mixing valves meeting ASSE 1070.

K. All mop sinks, service sink faucets to have integral check and screwdriver stops.

L. Wall faucets to include vacuum breaker, pail spout and wall brace.

M. All germ-fighting water closet seats shall be factory embossed or stamped that the water closet seat is germ-fighting (anti-microbial) by indication of model logo on the seat in a non-conspicuous location. This factory stamp shall indicate that the water closet seat is germ fighting (anti-microbial) and shall also be indicated on the water closet seat Shop Drawings.

N. All plumbing fixtures and accessories of the same generic type shall be the products of the same manufacturer unless specified otherwise.

O. All electric water coolers and/or drinking fountains shall be lead-free, and consumption shall not pass through, around or near lead of any form or sort.

P. Supplies to lavatory, sink, , or other fixtures shall be chrome plated brass flexible tube risers supplies with chrome plated brass solid (no plastic) keyed stops. Use of braided stainless steel wrapped flexible supplies is prohibited.

Q. Traps and tailpieces for sinks and lavatories shall be chrome plated cast brass with 17 ga. seamless tubular wall bends. Provide traps with cast brass slip nuts and metallic chrome plated shallow flange. Provide reducing washers as required.

2.02 CARRIERS

A. Provide heavy duty, rectangular vertical support, floor supported, commercial type fixture carrier for all new wall mounted plumbing fixtures, unless noted otherwise. Provide carrier-bearing plates for electric water coolers and urinals as part of the fixture carrier. Provide flush valve supply support as part of the urinal fixture carrier.

B. Water Closets: Floor supported, with buttress foot and foot anchor, rear foot support, flush valve supply support, finishing frame, cast iron, commercial type, neoprene gaskets. The studs and nipple on the carrier shall be adjustable without cutting or defacing the wall and still maintain a tight joint. Coordinate location of carrier closely with Architect.

C. All carriers shall be specifically chosen to accommodate the particular brand and style of fixture actually installed, the particular type of floor and wall actually present at each fixture location and the piping arrangement at each fixture. Furnish plastic or metal positioning frames to isolate carrier bolts from wall construction. Anchor carriers firmly to the floor with maximum sized bolts that feet will accommodate.

D. Provide neoprene carrier gaskets.

E. Zurn, J.R. Smith, Wade, MIFAB, Josam, or Watts.

2.03 ELECTRONICALLY CONTROLLED FIXTURES

A. Water Closet and Lavatory Combination Fixture:
   1. The fixture shall be electrically operated with 24 volt soft close, industrial type solenoid valves and sensors. The electrical hook-up of sensor and solenoid valves shall be with modular plug type connectors. Furnish a 110 volt primary and 24 volt secondary transformer, a B-1090-CR controller and hand controller.
   2. Connections from the transformer to the controller are made using 20/2 AWG (minimum) to 16/2 AWG (maximum) wire. All connections from pushbutton/switches to controller and from controller to solenoid actuators are accomplished using the Bauer patented plug. This plug is attached to the wire prior to shipping. Wire is #24 AWG, four conductor, color coded (black, red, green, yellow) flat telephone cable.
   3. Lavatory Control Sequence: Upon activation of hot water pushbutton, the water will run for twenty (20) seconds and then turn off. Upon activation of the cold water pushbutton, the water will run for ten (10) seconds and then turn off. Immediate repeat operation is possible. A Non-Hold Open feature which senses any button being depressed for longer than five (5) seconds will automatically disrupt the flow of water until the button is released and normal function is restored.
   4. Toilet Control Sequence: After the button is pushed, there is a two (2) minute delay before onset of flush cycle. If the fixture is flushed twice within a five (5) minute period, the system will automatically lock out and the toilet will not flush again for one (1) hour. After this delay, the toilet will resume normal operation.

B. Electronic Fixtures:
   1. Provide vandal-resistant electronic fixtures as scheduled on Drawings with proximity operation. Fixtures shall be complete with microprocessor controls and shall be low-voltage powered, without the use of batteries.
   2. Provide all transformers and wiring as necessary for low voltage power supply. Transformers shall have an adapter plate to mount directly on a 2-gang electrical junction box.

PART 3 EXECUTION

3.01 COORDINATION

A. See Architectural Drawings for the exact location of plumbing fixtures.

B. Review approved millwork shop drawings from the General Trades Contractor. Coordinate location and size of countertop fixtures, casework and openings before ordering or proceeding with rough-in work.

C. Countertop lavatory and sink openings and cabinet base backs for drains and water supply stop valves shall be cut by the General Trades Contractor. Furnish templates and locate. Coordinate with General Trades Contractor and Architect.

D. Coordinate location and rough-in requirements with equipment requiring plumbing with General Trades Contractor, other Contractors, and Owner.

3.02 INSTALLATION

A. Install fixtures according to the manufacturer's written installation instruction.

B. Refer to Architectural Drawings for fixture mounting heights.

C. At new floor and wall-mounted plumbing fixtures, caulk between fixture, floor and wall with silicone caulking compatible with the wall paint. Refer to Division 7 of Specifications for specific requirements. Exception: Electric watercoolers - caulk top and side of basin only.

D. Install fixture carriers and drainage fittings on wall hung fixtures such as water closets, lavatories, urinals, sink, electric water coolers, etc. Securely anchor all carriers to the floor.

E. Install chrome plated brass escutcheons on waste and supply piping at walls, including piping in cabinets.

F. Install liquid-seal traps on all plumbing fixtures except as permitted by the plumbing code.

G. Install stops on all cold and hot water supplies to fixtures.

H. Thoroughly clean all fixtures of paper and dirt before final acceptance.

I. Plug-in unit and adjust electric water coolers flow for correct operation and temperature of 55 degrees F outlet.

J. Provide all required seals, gaskets, nuts, bolts and washers.

K. Fixtures shall be carefully assembled and connected to the required plumbing inlets and outlets, and tested so fixtures will be functioning correctly when the Work is completed.

L. After the installation of the plumbing fixtures is completed, all connecting water pipes shall be flushed out through the fixtures to eliminate debris. Clean faucet and electric water cooler strainers and aerators. Refer to Specification Sections referring to Domestic Water Piping System, for sterilization of water lines.

M. Adjust self-sustaining water closet seats to self-sustain in any position.

N. Provide anchors and supports behind walls and chases for flush valve supply piping.

O. Do not permit the use of installed plumbing fixtures by construction personnel without prior written consent by the Owner. Any of the installed fixtures or trim found damaged prior to final acceptance shall be removed and replaced by the Contractor at no additional cost to the Owner.

P. Adjust faucets with temperature limit stops for a maximum leaving temperature of 120 degrees F.

Q. Adjust all flush valves and/or flush tanks for proper operation.

R. Adjust all sensor type automatic water coolers, faucets and flush valves for proper operation, per manufacturer's written installation instructions.

S. Install strainers on shower mixing valve inlets.

3.03 SPECIAL INSTALLATION INSTRUCTIONS

A. Install handicapped water closet flush valves so the control lever is on the wide side of water closet and no more than 44 inches A.F.F. Install handicapped urinal flush valve control levers at no more than 44 inches A.F.F. Coordinate locations with any grab bars.

B. Insulate all water and drain piping that could come in contact with wheelchair occupants. Refer to Section 22 07 01, "Plumbing Insulation" and Drawings.

3.04 ELECTRICAL WIRING INSTALLATION AND COORDINATION

A. Electronic Fixtures:
1. Branch circuit power wiring for power supplies for all electronic faucets, flush valves and showers shall be provided by the Electrical Contractor. The Electrical Contractor's work terminates at a junction box.
2. Install transformer(s) for electronic fixture power supplies and make final electrical connections.
3. Provide all wiring from transformers to electronic faucets, flush valves, and showers.
4. All wiring must conform to the NEC. In addition, install all wiring exposed in finished spaces in conduit. In mechanical rooms, chases, and janitor's closets, install wiring located within 96 inches of the floor in conduit.

B. Power wiring for electric water coolers shall be provided by the Electrical Contractor.

C. Power wiring for garbage disposer shall be provided by the Electrical Contractor.

D. Power wiring for hot water dispenser shall be provided by the Electrical Contractor.

END OF SECTION

SECTION 23 05 01
HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish material, labor, tools, accessories, and equipment to complete test, adjust, start up, balance, and successfully run all HVAC systems of this Project as described in these Specifications and as shown on the Drawings.

B. Refer to Sections 20 00 00 through 20 99 99 (as included) for items of a general nature which apply to this portion of the Work. Sections 23 00 00 through 23 99 99 (as included) describe the HVAC work.

C. It is the intent that the HVAC Work be complete in every respect.

1.02 LICENSES

A. The installation of this HVAC work shall be made by a Contractor and craftsmen licensed by the Governing Authorities.

B. Obtain all permits and licenses required by Local Code Authorities having jurisdiction.

1.03 FEES

A. Unless otherwise noted, this Contractor shall pay for all permits, inspection fees, and other charges related to the installation and inspection of the HVAC work.

1.04 CODES, REGULATIONS, AND STANDARDS

A. Unless otherwise noted, the latest enforced Edition shall apply to this work.

END OF SECTION

SECTION 23 05 93
HVAC SYSTEMS BALANCING

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all labor, materials, and tools for completely testing, balancing and adjusting the air and water systems.

B. The HVAC Contractor shall retain the services of an Independent Testing, Adjusting, and Balancing (TAB) Agency that specializes in, and whose business is limited to, the testing and balancing of HVAC systems.

1.02 SUBMITTALS

A. Strategies and Procedure Plan: Submit a step by step, test and balance procedures plan. The plan shall include equipment and systems to be tested, strategies and step by step procedures for balancing, instruments to be used and sample forms.

B. Provide a summary report of the examination review, if any issues are discovered that may preclude the proper testing and balancing of the system.

C. Certified Report: Within 14 days of completion of the balancing work, submit a certified test and balance report.

1.03 QUALITY ASSURANCE

A. Agency shall be fully certified by AABC or NEBB.

B. Standards: AABC National Standards for Total System Balance or NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

C. Instruments used for testing and balancing shall have been calibrated within a period of six months and checked for accuracy prior to start of work on this project.

D. The agency shall also comply with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing. Examine the approved submittals for HVAC systems and equipment.

B. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed and controls are ready for operation. Examine terminal units and verify that they are accessible and controls are connected, configured and functioning. Examine strainers to verify that mechanical contractor has replaced start up screens with permanent screens and that all strainers have been cleaned. Examine two-way and three-way valves for proper installation and function. Examine heat transfer coils for correct piping connections and for clean and straight fins. Examine air vents to verify that mechanical contractor has removed all air from the hydronic system.

3.02 GENERAL PROCEDURES

A. Air Systems: Prepare test reports for both fans and outlets. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes. Prepare a single-line schematic diagram of systems for the purpose of identifying HVAC components. For variable-air-volume systems, develop a plan to simulate diversity. Determine the best locations in main and branch ducts for accurate duct-airflow measurements. Locate start-stop and disconnect switches, electrical interlocks, and motor starters. Verify that motor starters are equipped with properly sized thermal protection. Check condensate drains for proper connections and functioning. Check for proper sealing of air-handling-unit components.

3.03 AIR SYSTEMS

A. After all equipment and duct installation, the air systems shall be balanced for proper distribution. For systems with diversity, determine the diversity factor and simulate the system diversity by closing the required number of control dampers. Repeat this procedure through the system. Do not make fan speed adjustments that result in motor overload. Operate the system in all modes to assure the fan motors will not overload. Verify final operation of the equipment and fan. Provide a complete profile of static pressures throughout the air handling unit components.

B. In measuring velocities in ducts or at outlets, traverse the duct or outlet so that one reading is taken for each 80 square inches maximum of flow area, but a minimum of six readings shall be taken for each duct or outlet regardless of size.

C. Determine by field measurements the installed K-factor of each terminal box. Set correct value in the BAS and record the value in the final report.

3.04 TOLERANCES

A. Flow rates shall be balanced within plus or minus 5% of design conditions. Any discrepancies exceeding this range or items not in accordance with contract documents, which may affect the total system or systems balance shall be reported to the HVAC Contractor for corrections. Balance procedures shall be repeated following corrections to confirm that corrections were made.

B. Assist the Mechanical Contractor in the selection of additional fixed sheaves as required to achieve the proper final balance of belt drive units. Sheaves and belts shall be furnished and installed by the Mechanical Contractor.

C. Verifications shall continue, at no cost to the Owner, until the system is in compliance with the Contract Documents.

3.05 FINAL TEST AND BALANCING REPORT

A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the technicians or test and balance engineers. As a minimum, the report shall include the following:
   1. Title Page
   2. Table of Contents
   3. Performance Guarantee
   4. Report Summary including a list of items that do not meet tolerances with information that may be considered in resolving the deficiencies.
   5. Test and Balance Data

B. Provide final copies, in accordance with the submittal requirements, of the final test and balance report to the Engineer.

END OF SECTION

SECTION 23 07 05
HVAC INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Insulate the following:
   1. Piping:
      a. Condensation drain
      b. Refrigerant lines
   2. Ductwork:
      a. Supply
      b. Return/Exhaust ducts and Transfer Air ducts in the attic space (within the truss space of the new addition)

B. Refer to Section 23 31 10, "Low Velocity Ductwork" for duct liner.

1.02 QUALITY ASSURANCE

A. Indoor pipe and duct insulation shall have a flame-spread rating not exceeding 25, a smoke-developed rating not exceeding 50, and a fuel-contributed rating not exceeding 50. All insulation accessories shall have similar ratings. All rating procedures shall meet the standards set in ASTM E-84, NFPA 255, and UL 723.

B. Install insulation to according to "Commercial and Industrial Insulation Standards," as published by the Midwest Insulation Contractor's Association, latest edition.

C. Insulation values shall be in accordance with the State Energy Codes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture condensation and physical abuse.

1.04 MANUFACTURERS

A. Fiberglass-based insulation: Owens-Corning, Manson, Knauf, or Johns-Manville.

B. Closed-cell elastomeric insulations: Armacell, Rubatex, or IMCOA.

C. Calcium silicate insulation: Pabco Super Caltemp Gold 1500, or approved equal by Kaylo.

D. Polyisocyanurate insulation: Dow Chemical Company

PART 2 PRODUCTS

2.01 ADHESIVES, FINISHES, AND MASTICS

A. Use the following items or equivalent items:
1. Vapor barrier lap adhesive - Foster Drion Contact Bond Cement 85-75
2. Lagging adhesive - Foster 81-42W
3. Metal bonding adhesive - Foster 85-15
4. Indoor vapor barrier finish - Foster 30-80
5. Indoor breather finish - Foster Lagtone 46-50
6. Outdoor vapor barrier mastic - Foster 46-50
7. "Fuse-Seal" sticks and applicator (for polyolefin insulation)

2.02 THERMAL RESISTANCE OF PIPING INSULATION

A. Insulate all piping installed to serve buildings and within buildings in accordance with the minimum pipe insulation as listed in the following table. Pipe insulation not required between control valve and heating coil on runouts when the control valve is within 4 feet of coil and piping is 1 inch or smaller. Condensate system design temperature shall match the saturation temperature of the steam system they drain.

Minimum Insulation Thickness for Pipe Sizes (Inches)

Piping System Types	Fluid Temperature Ranges (°F)	Less than 1	1 to 1-1/4	1 1/2 to 3	4 to 6	8 and Over
Cooling systems:						
Condensate	Above 40	0.5	1.5	1.5	1.5	1.5
Refrigerant	Below 40	1.0	1.5	1.5	1.5	1.5

B. Pipe sizes are nominal dimensions. For piping exposed to outdoor temperatures, increase thickness by 0.5 inches.

2.03 INDOOR PIPING

A. Use fiberglass, heavy-density insulation with all service jacket and pressure sealing lap adhesive on longitudinal and butt strips. Jacket vapor membrane shall have an installed vapor permeance of not more than 0.09 perms. Staple and seal with pressure-sealing lap adhesive on longitudinal and butt strips. Insulation conductivity shall be in accordance with the following table. Condensate system insulation design temperature shall match the saturation temperature of the steam system they drain.

Piping System Types	Fluid Design Temperature Ranges (°F)	Insulation Conductivity Range (Btuh in./ft^3 deg. F)	Mean Rating Temperature (°F)
Cooling systems:			
Condensate	Above 40	0.21-0.27	75
Refrigerant	Below 40	0.20-0.26	50

2.04 EXPOSED INDOOR PIPING UP TO 10 FEET ABOVE NEAREST WALKING SURFACE

A. Insulation same as for indoor piping. Cover with ultraviolet-resistant PVC jacket. Jacket is to be self-extinguishing and have zero fuel contribution. All piping visible inside and outside mechanical room is considered exposed.
   1. Ceel-Co Ceel-Tite 300 Series or Foster Sealfas.

2.05 FITTINGS AND VALVES

A. Premolded PVC covers over molded insulation. Insulation same thickness as on adjoining pipe. Insulation shall have a flame-spread rating not exceeding twenty-five (25) and a smoke-developed rating not exceeding fifty (50). Exception: heating valves and unions, or any components specified to have removable covers.

2.06 OUTDOOR PIPING

A. Insulation type and vapor barrier shall be the same as indoor piping. Increase insulation thickness by 1/2 inch, minimum. Cover with ultraviolet-resistant PVC jacket. Jacket is to be self-extinguishing and have zero fuel contribution.
   1. Ceel-Co Ceel-Tite 300 Series or Foster Sealfas.

2.07 PIPE INSULATING SUPPORT

A. Refer to Section 20 05 45, "Hangers, Supports, and Inserts." The use of thermal protectors as pipe insulation support are noted elsewhere in this Specification. Maintain insulation vapor barrier integrity where inserts are used.

2.08 REFRIGERANT PIPING

A. Insulation for all indoor refrigerant piping shall be the same as for indoor piping.

B. Insulation requirements for all outdoor refrigerant piping shall be the same as for outdoor piping.

C. Option: Flexible elastomeric thermal insulation K=0.27 at 75 degrees F, as manufactured by Armacell, Rubatex, or IMCOA. Indoor insulation must meet a flame-spread rating not exceeding twenty-five (25) and a smoke-developed rating not exceeding fifty (50), as specified in Paragraph 1.02.A.

2.09 INSULATE DUCTWORK AS FOLLOWS

Duct Type	Minimum Insulation Thickness (Inches)	Minimum R-Value (As-installed; not including film resistance)
Concealed-round or rectangular	2	6.0
Exposed-round	1 1/2	4.5
Exposed-rectangular	1	4.3
Exposed-rectangular-outdoors	2	8.0
Exposed-round-outdoors	2	8.0

2.10 CONCEALED DUCTWORK - ROUND OR UNLINED RECTANGULAR

A. Flexible fiberglass duct wrap laminated to foil-reinforced kraft vapor membrane facing with 2 inch stapling flange, 1.0 pcf density, K=0.27 at 75 degrees F, Owens-Corning Commercial Grade Fiberglass Duct Wrap Type 100. Installed vapor membrane shall be less than 0.09 perms.

2.11 EXPOSED DUCTWORK - ROUND

A. Flexible fiberglass duct wrap laminated to foil-reinforced kraft vapor membrane facing with 2 inch stapling flange, 1.0 pcf density, K=0.27 at 75 degrees F, Owens-Corning Commercial Grade Fiberglass Duct Wrap Type 100. Installed vapor membrane shall be less than 0.09 perms.

2.12 EXPOSED DUCTWORK - UNLINED RECTANGULAR

A. Rigid fiberglass industrial board with foil scrim kraft vapor membrane facing, 6.0 pcf density, K=0.22 at 75 degrees F, Owens-Corning Industrial Type 705. Option: ASJ Jacket. Installed vapor membrane shall be less than 0.09 perms.

B. Provide a glossy white, high impact, abrasion-resistant, UV-resistant polyvinyl chloride compound, have a minimum 30 mil thickness, and have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. Ceel-Co 300 Series jacketing, or approved equal, joined with Ceel-Tite welding adhesive to result is a completely sealed and self-supporting monolithic system. Jacket is not required for ductwork in mechanical room.

2.13 EXPOSED DUCTWORK – OUTDOOR INSULATION AND IN ATTIC AREA

A. Insulation material shall be a flexible, closed-cell elastomeric insulation in sheet form: AP Armaflex SA sheet and roll insulation, 2 inch installed thickness. This product meets the requirements as defined in ASTM C 534, specification for preformed elastomeric cellular thermal insulation in sheet and tubular form.

B. Materials shall have a flame spread rating of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E 84, latest revision. Sheet material with a thickness greater than 1 inch shall have a flame spread rating of 25 or less and a smoke developed rating of 100 or less when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive, and all materials shall pass simulated end-use fire tests.

C. Materials shall have a minimum thermal conductivity of 0.25 Btu-in./h-ft2 - °F at a 75 degrees F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.

D. Materials shall have a minimum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

E. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity, and water vapor transmission.

F. Duct insulation that is installed shall be wrapped not stretched around the duct, and shall be adhered directly to clean, oil-free surfaces with a full coverage of adhesive. All insulation shall be adhered directly to clean, oil-free surfaces.
   1. The duct insulation shall be constructed from the bottom up, with the top insulation sized to extend over the side insulation. This will form a watershed.
   2. Butt-edge seams shall be adhered using Armaflex 520 Adhesive by the compression fit method to allow for expansion/contraction. Leave a 1/2 inch-wide uncoated border at the butt-edge seams on the duct surface and the insulation surface. Overlap the insulation 1/4 inch at the butt-edges and compress the edges into place. Apply Armaflex 520 Adhesive to the butt-edges of the insulation.
   3. Standing metal duct seams shall be insulated with the same insulation thickness as installed on the duct surface. Seams may be covered using strips of Armaflex Sheet Insulation or half sections of tubular pipe insulation with miter-cut ends. Standing seams shall be adhered using Armaflex 520 Adhesive.
   4. Insulation seams shall be staggered when applying multiple layers of insulation.
   5. On round ductwork larger than 12 inches in diameter, the insulation shall be adhered to the duct surface on the lower one third. On ductwork greater than 24 inches in diameter, the insulation shall be completely adhered to the duct surface.

G. Use the following duct insulation adhesives or equivalent items, as recommended by the insulation manufacturer:
   1. Insulation adhesive - Armaflex 520 BLV
   2. Insulation spray adhesive - Armaflex Low VOC Spray Contact Adhesive

2.14 EXPOSED DUCTWORK – OUTDOOR INSULATION AND ATTIC AREA JACKET

A. Jacketing shall be produced from a glossy white, high impact, abrasion-resistant, UV-resistant polyvinyl chloride compound. Jacketing shall have a minimum 30 mil thickness, and have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. Ceel-Co 300 Series jacketing, or approved equal, joined with Ceel-Tite welding adhesive to result is a completely sealed and self-supporting monolithic system.

PART 3 EXECUTION

3.01 INSTALLATION NOTES

A. Use no damaged or water-soaked insulation.

B. Insulate piping where concealed in walls.

C. Make insulation continuous through sleeves and hangers, except through fire-rated walls.

D. Leave no "raw" ends on insulation. Bevel insulation terminations, seal with insulating cement, and cover ends with glass cloth or similar to pipe insulation covering.

E. Ensure that exposed insulation has a neat and finished appearance. Size insulation if required and leave ready for painting.

F. Ensure that jacket has overlapping joints and is sealed with suitable adhesive. The use of staples is acceptable on heating hot water systems only, but only as an installation aid and not as a substitute for adhesive.

G. Brush coat all staples used with a white vapor barrier mastic.

H. Use adhesive and welded pins with washers for attaching liner and rigid board insulation to ductwork. Seal joints with a 2 inch wide application of adhesive.

I. Provide sheet metal lips on leading and leaving air edges at liner transitions.

J. All duct sizes shown are clear inside dimensions.

K. Tape and seal all joints.

L. Duct insulation that is installed shall be wrapped not stretched around the duct. On ductwork larger than 12 inches in diameter, the insulation shall be adhered to the duct surface on the lower one third. On ductwork greater than 24 inches in diameter, the insulation shall be completely adhered to the duct surface. Butt-edge seams shall be adhered using adhesive by the compression fit method to allow for expansion/contraction. Overlap the insulation at the butt-edges and compress the edges into place. Apply adhesive to the butt-edges of the insulation.

END OF SECTION

SECTION 23 08 01
HVAC SYSTEM CONFIRMATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide HVAC System Confirmation to ensure the proper operation of all HVAC systems as complete systems, including all items of equipment, piping and controls. Perform the confirmation in four separate steps:
   1. 120 Hour Test
   2. Initial Confirmation Period
   3. Summer Confirmation Period
   4. Winter Confirmation Period

   Steps 1 and 2 must be completed prior to Final Completion; Steps 3 and 4 may be completed after Final Completion as Special Warranty Work.

B. 120 Hour Test: After the completion of all operational checks of the equipment, and after all control system function checks and all software debugging is complete, the Contractor shall demonstrate the automatic operation of the system by having the systems operate under the automatic controls without any intervention from the Contractor or the Owner's operators for a period of 120 continuous hours. The test will be considered successful if all systems operate properly without intervention, and if no alarm conditions occur and all set points are continuously maintained as indicated in the documents, or if in the Engineer's judgment, the reasons for all failures are trivial and beyond the control of the Contractor.

C. Initial Confirmation Period: During an eight (8) week period immediately after the successful completion of the 120 Hour Test and after the final punch list items have been completed, the Initial HVAC System Confirmation shall commence and shall include:
   1. Documentation of proper operation of all control devices.
   2. Documentation of all sensor operation and calibration.
   3. Confirmation of all Modes of Operation: Operate the system in every mode of operation, all combinations of fans and air handling units, indicated in the sequence of operation for a period of time not less than three (3) hours each with the Owner's operating personnel present to verify the operation.
   4. Computer Trend Logs: During the Initial Confirmation Period, monitor the HVAC control system operation and provide computer trend logs to the Owner on each Monday for the duration of the confirmation period. The logs shall record on a hourly basis, all temperatures and static pressures measured for control or monitoring purposes within all air handling units, air handler damper signals, all space temperatures, all variable frequency drive command signals, and a listing of what equipment is in operation and all alarm conditions. Submit a weekly report on the data from the trend logs to the Owner, including an explanation of all alarms, set points that were not maintained and the corrective action taken. If the system is not operating as designed, i.e. the trend logs of more than two (2) weeks have instances of alarms or set points not being maintained, the confirmation period will be extended until there are no more alarms for four (4) additional weeks.

D. Summer Confirmation Period: For four (4) weeks in the July following the Initial Confirmation Period (or during the next four (4) weeks following the Initial Confirmation Period if it ends in July), monitor the HVAC control system operation and provide computer trend logs to the Owner on each Monday. The logs shall record on a hourly basis, all temperatures and static pressures measured for control or monitoring purposes within all air handling units, all air handler damper signals, all space temperatures, all variable frequency drive command signals, and a listing of what equipment is in operation and all alarm conditions. Submit a weekly report on the data from the trend logs to the Owner, including an explanation of all alarms, set points that were not maintained and the corrective action taken.

E. Winter Confirmation Period: For four (4) weeks in the January following the Initial Confirmation Period (or during the next four (4) weeks following the Initial Confirmation Period if it ends in January), monitor the HVAC control system operation and provide computer trend logs to the Owner on each Monday. The logs shall record on a hourly basis, all temperatures and static pressures measured for control or monitoring purposes within all air handling units, all air handler damper signals, all space temperatures, all variable frequency drive command signals, and a listing of what equipment is in operation and all alarm conditions. Submit a weekly report on the data from the trend logs to the Owner, including an explanation of all alarms, set points that were not maintained and the corrective action taken.

1.02 GENERAL

A. Provide all necessary products, equipment and manpower to operate the HVAC system for the 120 Hour Test.

B. Provide all necessary products, equipment and manpower to complete all four steps of the HVAC System Confirmation.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 GENERAL

A. The HVAC system shall be operated successfully for a period of 120 hours as described above before any HVAC system will be confirmed.

B. The HVAC Contractor shall have one (1) licensed electrician, two (2) functionally-proficient HVAC mechanics, and two (2) functionally-proficient employees of the Temperature Control Contractor or BAS Contractor available on a twenty-four (24) hour, seven (7) day-a-week basis with a guaranteed two (2) hour response time to the site for the duration of the Initial Confirmation Period. The above stated manpower shall have each worked on the HVAC system installation for a minimum of 120 hours of which forty (40) hours is to be during the operational check of the plant. If the response time exceeds two hours, the Owner has the option of providing the necessary manpower to correct the problem, at the expense of the HVAC Contractor.

C. The HVAC Contractor is responsible for any equipment that is damaged in any way during the 120-Hour Test, or the initial confirmation of the HVAC system. The HVAC Contractor shall be responsible for all costs associated with the restoration of the equipment to its original condition and for any temporary equipment needed to keep the system in operation.

D. If, for any reason, the HVAC system operation during the confirmation period generates a condition that does not meet the Sequences of Operation, the condition shall be corrected at the Contractor's expense. Provide to the Owner a written report explaining why the failure occurred and how it was corrected.

END OF SECTION

SECTION 23 09 23
TEMPERATURE CONTROL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Provide a complete "Web-based" Building Automation System (BAS) to control and monitor all equipment specified herein and indicated on the Contract Drawings. System components include, but are not limited to:
   1. Operator's Workstation
   2. Web access communication hardware
   3. Direct Digital Controllers
   4. BACnet TCP/IP over LAN Communication Protocol throughout DDC at the Building or Primary controller level (Tier 1).
   5. BACnet MS/TP Communication Protocol throughout the secondary DDC Network (Tier 2).
   6. Electronic Damper Actuation
   7. Manufacturer Unit Mounted Controllers
   8. Electric Controls (Line Voltage)
   9. Electronic Controls (Low Voltage, non-DDC)

B. All work of this Section shall be coordinated and provided by a single BAS Contractor. The BAS work shall consist of the provision of all items required to provide a complete, fully functional and commissioned BAS performing the specified sequences of operation.

C. The BAS shall be a complete system designed for use on Intranets and the Internet. This functionality shall extend into the equipment rooms. Primary panels located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. The BAS Contractor shall be responsible for coordination with the Owner's IT staff to ensure that the BAS will perform in the Owner's environment without disruption to any other activities taking place on that LAN.

D. All points of user interface shall be on standard personal computers (PCs) that do not require the use of any special software from the BAS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser such as Microsoft Edge or Google Chrome.

E. Servers shall be used for providing a location for archiving system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform.

F. The BAS shall assume control of all equipment with a manufacturer provided control package. Coordinate with equipment manufacturer for any interface requirement.

G. At minimum, The BAS as provided shall incorporate the following integrated features, functions and services:
   1. Operator information, alarm management and control functions at any Operator's console without the need for special software from the BAS manufacturer for those consoles.

2. Primary (LAN) information and control functions.
3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
4. Diagnostic monitoring and reporting of BAS functions.
5. Offsite monitoring and management
6. Energy management
7. Indoor Air Quality monitoring and control

1.02 QUALITY ASSURANCE

A. General
1. The BAS Contractor shall be a manufacturer authorized office and have a minimum of ten years experience with the complete installation of Building Automation Systems of similar size and technical complexity.
2. The BAS Contractor shall employ all specialists necessary and be regularly engaged in the field of Building Automation Systems. Specialists shall be capable of performing the design and detailing, and shall have a working knowledge of the HVAC systems being controlled.
3. The BAS shall consist of the products of a manufacturer regularly engaged in the production of such systems and shall be the manufacturer's latest standard of design at the time of installation.
4. Routine maintenance and emergency service shall be available within twenty-four (24) hours upon receipt of request.
5. At the start of the warranty period, the BAS software shall be updated to the most recent revision.

B. The BAS Contractor shall:
1. Have a local branch facility within a 100-mile radius of the job site supplying complete maintenance and support services. Emergency service shall be available on a twenty-four (24) hour, seven (7) day-a-week basis.
2. Be responsible for all work fitting into place in a satisfactory and neat workmanlike manner acceptable to the Owner/Architect/Engineer.
3. Provide software support: All application design of the computerized control and monitoring system. In addition to the language manuals, flow charts, lists, and other documentation specified, the manufacturer shall locally maintain a software test, debug, and development facility to support software additions and modifications in an off-line environment.
4. Provide hardware support: Maintain a local maintenance support facility complete with system technicians, diagnostic and test equipment and routines, and new spare digital controllers and control components.
5. Provide a competent and experienced Project Manager employed by the BAS Contractor and supported as necessary to provide professional management service for the project. The Project Manager shall attend scheduled Project Meetings as required and shall be empowered to make technical, scheduling, and related decisions on behalf of the BAS Contractor.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Conformance with all sections of the specification is required. Additional requirements for the equipment specified within this section are included in, but not limited to, the following sections:
   1. 20 05 05, "HVAC General Requirements"
   2. 20 05 10, "Coordination Between Trades"
   3. 20 05 15, "Submittals"
   4. 23 09 93, "Sequences of Operation"
   5. 23 81 28, “Variable refrigerant Flow Air Conditioners
   6. 23 75 13, “Dedicated Outside Air Supply Units

1.04 COORDINATION

A. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades and equipment manufacturers to ensure a fully functioning and complete BAS.

B. All automatic control dampers, control valves, separable sockets, flow switches, flow sensors, and other in-line pipe devices, furnished by the BAS Contractor shall be installed by the HVAC Contractor under the BAS Contractor's supervision. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the HVAC Contractor.

C. The demarcation of work and responsibilities between the BAS Contractor and other related trades shall be as outlined in the Responsibility Matrix herein. This matrix is not intended to relieve the HVAC Contractor of the obligation to assure the complete execution of any work for which responsibility is assigned to the BAS Contractor, when the BAS Contractor is a sub-contractor to the HVAC Contractor.
   1. Key:

BAS	Building Automation System Contractor
P	Plumbing Contractor
H	HVAC Contractor
E	Electrical Contractor
EP	Power for the device controls is provided by means internal to the device. Control power is provided from the power circuit to the device, which is the responsibility of the Electrical Contractor.
Wiring Note:	Power wiring by "BAS" indicates that the BAS Contractor is responsible for extending power from a junction box or source, which has been provided by the Electrical Contractor, to a device or through a transformer to low voltage system. Transformer is to be provided by the BAS Contractor.

RESPONSIBILITY MATRIX						
	WORK	**Provided By:**	**Furnished By:**	**Installed By:**	**Low Voltage Wiring By:**	**Power Wiring By:**
1.	Automatic Control Dampers and Actuators		BAS	H	BAS	BAS
2.	Current Switches	BAS			BAS	
3.	Fan Coil Unit Controls	BAS			BAS	EP
4.	Unit Heater Controls	BAS			BAS	EP
5.	Packaged DOAS, Factory-Mounted Controls	H			BAS	EP
6.	Duct Smoke Detectors		E	H		E
7.	Fire Alarm Wiring from all Detectors				E	
8.	Wiring from Smoke Detector/Fire Alarm to Control LED Devices and/or Smoke Damper Actuators				BAS	

D. Shop Drawings

1. Equipment and systems requiring approval by authorities must comply and be approved prior to submittal. Approval shall be at the expense of the BAS Contractor. Provide a copy of all related correspondence and permits to the Owner.
2. BAS System Network Architecture - One page diagram depicting the BAS complete showing Internet and Intranet access for control and monitoring.
3. AutoCAD generated schematics, flow drawings and detailed Sequence of Operation for all equipment controlled by the BAS.
4. Graphic penetration tree showing all graphics.
5. A bill of material reference list.
6. Control Damper Schedule including a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.
7. Schedule including a separate line for each terminal unit indicating minimum/maximum cfm, pickup gain, box area, and bias setting.
8. Manufacturer's catalog data describing each item of control equipment or component provided and installed for the project.
   Points schedule for each real point in the BAS, including: Tag, Point Type, System Name, Display Units, Node Type, Address, Terminal ID, Panel, Slot Number, Reference Drawing, and Connection point.
9. Point-to-point wiring diagrams showing all temperature controls, start-stop arrangement for each piece of equipment, equipment interlocks, wiring terminal numbers and any special connection information required for properly controlling the mechanical and lighting equipment and monitoring the fire alarm system.
10. Data entry forms for initial parameters. Contractor shall provide English listing of:
    a. All analog points with columnar blanks for high and low warning limits and high and low alarm limits.
    b. All fan systems with columnar blanks for beginning and end of occupancy periods.
    c. Samples of proposed text for points and messages.

E. Systems Completion Statement
   1. Submit a report upon project completion stating that the system is complete, has been adjusted and is operating in accordance with the Specifications and is ready for commissioning as specified elsewhere. Any deviations from specified settings or operations necessitated during system adjustment shall be specifically noted.

F. Operation and Maintenance Manuals
   1. Submit manuals immediately following receipt of notification of contract completion.
   2. Provide three complete sets of operation and maintenance manuals in a three-ring notebook and organized by subject, by systems and by equipment with divider tabs. Provide the following information
      a. Table of Contents
      b. Commissioning Report
      c. Certificate of Instruction of Owner Personnel
      d. Hardware demonstration and system acceptance test certificate
      e. Final copies of the shop drawings outlined in paragraph above. These final submittals shall reflect all field modifications and change orders required to complete the installation.
      f. System Operator's manuals (hardware and software).
      g. Archive copy of all site-specific databases and sequences.
      h. BAS network diagrams.
      i. Wiring termination schedules.
      j. Interfaces to all third-party products and work by other trades.
      k. Maintenance Instructions: Document all maintenance and repair/replacement procedures. Provide ordering number for each system component, and source of supply. Provide a list of recommended spare parts needed to minimize downtime.
   3. In addition to the binders, the entire Operation and Maintenance Manual shall be furnished on Compact Disc media. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the project record drawings and data sheets. A logically organized table of contents shall provide dynamic links to view and print all project record drawings and product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents. The CD-ROM(s) shall contain adequate space for future system updates.
   4. On-line Documentation: After completion of all the tests and adjustments, the contractor shall install the following information on the BAS:
      a. All necessary Node and OWS software updates to ensure all BAS software is at the current revision.
      b. Record Drawing files
      c. Detailed catalog data on all installed system components with address and phone number of factory repair service.

1.05 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem.

B. Analog: A continuously varying system or value (temperature current, velocity, etc.) not having discrete levels.

C. Application Specific Controller (ASC): A general purpose, programmable controller dedicated to a single or multiple mechanical systems with the required processing capabilities and universal input/output configuration to satisfy the specified sequence of operation.

D. BACnet: A data communication protocol for building automation control networks created and approved by ASHRAE Standards Committee 135.

E. Building Automation System (BAS): The total system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BAS Contractor and to be interfaced to the work of other trades.

F. BAS Contractor: The contractor or sub-contractor providing the work of this Section. This contractor shall be the primary supplier, installer, commissioner, and ongoing control service provider for the BAS.

G. BAS Integration: The complete functional and operational interconnection and interfacing of all BAS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent BAS as required by this Section.

H. BAS Network: The total digital, on-line, real-time, interconnected configuration of BAS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

I. Binary: A two-state system where an "on" condition is represented by one discrete signal level and an "off" condition is represented by a second discrete signal level each separated by a defined dead-band. (Digital Inputs and Digital Outputs are examples.)

J. Control Sequence: A pre-programmed arrangement of software algorithms, logical computation, target values and limits to attain defined operational control objectives.

K. Control Wiring: Includes conduit, wire and wiring devices to install complete a control system including, but not limited to, motor control circuits, interlocks, thermostats, all wiring from panel to panel and from panel to sub-panels and components such as sensors and points required to execute the control sequence.

L. Dead-band: A controlled range over which no change in action is supplied.

M. Direct Digital Control (DDC): The digital algorithms and pre-defined arrangements included in the BAS software to provide direct, closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

N. Distributed Control: A system whereby all control processing is decentralized and independent of a central computer.

O. Global Control Panel (GCP): A control panel residing on the building LAN and supervising the secondary tier control network and routing communications between them.

P. Network: A system of distributed control units that are linked together on a communication bus. A network allows sharing of point information between all control units. Additionally, a network provides central monitoring and control of the entire system from any distributed control unit location.

Q. Node: A digitally programmable entity existing on the BAS network.

R. Operator's Work Station (OWS): The main command terminal over the BAS. The OWS consists of a high level-processing computer with varying devices of quality and capability based on the application requirements

S. Peripheral: Input/Output equipment that communicate with the computer and make hard copies of system outputs and magnetic files. Peripherals include monitor, printer, hard drives, disk drives, modems, etc.

T. Protocol: A defined set of rules and standards governing the on-line exchange of data between BAS network nodes.

U. Router: A device which routes messages destined for a node on another segment sub-net or domain of the control network. The device controls message traffic and shall also serve as communication links between power line, twisted pair and RF media.

V. Software: All programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BAS industry for real-time, on-line, integrated BAS configurations.

W. Tier 1: The level of the BAS Network communicating via the facility LAN between GCP's, GCP's and OWS's and any device and server.

X. Tier 2: The level of the BAS network communicating via the BAS Network from the GCP to the ASC's or controlled devices.

Y. The following abbreviations and acronyms may be used in describing the work of this Division:

AI	-	Analog Input
AO	-	Analog Output
BAS	-	Building Automation System
CFM	-	Cubic Feet Per Minute
DI	-	(Binary) Digital Input
DO	-	(Binary) Digital Output
EEPROM	-	Electronically Erasable Programmable Read Only Memory
FAS	-	Fire Alarm Detection and Annunciation System
GUI	-	Graphical User Interface
HOA	-	Hand-Off-Auto
I/O	-	Input/Output
LAN	-	Local Area Network
LED	-	Light Emitting Diode
NC	-	Normally Closed
NIC	-	Not In Contract
NO	-	Normally Open

OWS	-	Operator's Workstation
RF	-	Radio Frequency
RH	-	Relative Humidity
RTD	-	Resistance Temperature Detector
TCP/IP	-	Transmission Control Protocol/Internet Protocol
UPS	-	Uninterruptible Power Supply
VAC	-	Volts, Alternating Current
VAV	-	Variable Air Volume
VDC	-	Volts, Direct Current
WAN	-	Wide Area Network

1.06 WARRANTY

A. The BAS shall be free from defects in workmanship and material under normal use and service for a period of two years from the date of substantial completion. If within that time, any defect is found in operation, workmanship or materials the defect shall be replaced, repaired, or adjusted (at the option of the BAS Contractor) at the Contractor's expense. Service shall be provided within twenty-four (24) hours upon notice from the Owner.

B. The warranty shall extend to material that is supplied and installed by the BAS Contractor.

C. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks. At the end of the warranty period, the Contractor shall prepare three duplicate copies of all control software on non-volatile magnetic media. Two copies, complete with hardware and software interfaces and full down-line reloading instructions, shall then be turned over to the Owner.

Maintain an on-site record of all work done, all items removed from site, all items returned to the site, all new replacement items installed and all remedial programming, database entry work and recalibration undertaken including software revisions installed as a result of Warranty service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers
1. Comfort Systems
2. Automated Logic Corporation
3. Delta Controls
4. EcoStruxure by Schneider Electric
5. Johnson Controls, Inc. by CFS
6. Alerton Controls installed by K Company

2.02 BAS ARCHITECTURE

A. Description
1. The BAS shall be designed for use on intranets and internets. All networking technology used at the building communication or Tier 1 level shall be industry standard technology fully compatible with Owner provided networks in the facility. The communication protocol at the Tier 1 level shall be BACnet TCP/IP.
2. The user interface will be complete, providing complete tool sets, operational features, multi- panel displays, and other display features. Systems which merely provide HTML based web pages as the operator interface will not be acceptable.
3. The components on the primary tier of the network architecture system shall be the Operator's Workstation, Global Control Panels and Servers. All will use the same user interface and provide the same level of accessibility via the network.
4. Provide licenses for all software in the BAS and transfer these to the Owner prior to completion.

B. General
1. The BAS shall consist of nodes and associated equipment connected by industry standard network practices. All communication between nodes shall be by digital means.
2. At minimum, the BAS network shall include the following:
   a. Operator Workstations – fixed or portable.
   b. Network processing, data storage and communication equipment including file servers.
   c. Active processing nodes including field panels.
   d. Intelligent and addressable elements and end devices.

C. Network
1. The BAS shall incorporate a primary Tier 1 network. At the Contractor's option, the BAS may also incorporate an integrated secondary Tier 2.
2. The BAS Network shall utilize an open architecture capable of all of the following:
   a. Utilizing standard Ethernet communications and operating at a minimum speed of 10/100 Mb/sec
   b. Connecting via BACnet Protocol at the Tier 1 level in accordance with ANSI/ASHRAE Standard 135-2001.
   c. Connecting via BACnet Protocol in accordance with ANSI/ASHRAE Standard 135-2001 at the Tier 2 level.
3. The BAS network shall support the LAN cabling system within the building.
4. The BAS shall include necessary components to accept and integrate controllers by alternate vendors or be integrated by an alternate vendor. The communication protocols described herein are required to meet this intent, both within this project and in future alterations and by both the BAS and the future components.

D. Third-Party Interfaces
1. BAS Contractor shall integrate real-time data from systems supplied by other trades as required herein.
2. The BAS system shall include necessary hardware equipment and software to allow data communications between the BAS system and systems supplied by other trades.
3. The trade contractor supplying other systems will provide their necessary hardware and software and cooperate with the BAS contractor in a timely manner at their cost to ensure complete data integration.

E. Power Fail/Auto Restart
   1. Provide for the automatic orderly and predefined shutdown and automatic orderly and predefined startup of the BAS following loss of power. Archive and annunciate time and details of restoration.
   2. Provide for the orderly, predefined and controlled return to normal operation of controlled equipment as a result of the auto restart process.
   3. Maintain the BAS real-time clock operation during periods of power outage for a minimum of 72 hours.

F. Downloading and Uploading
   1. Provide the capability to generate software-based sequences, database items and associated operational definition information and user-required revisions at any OWS and the means to download same to the associated controller.
   2. Application software tool used for the generation of sequences shall be resident in both the node and the server.
   3. Provide the capability to upload operating software information, database items, sequences and alarms to the designated server(s).

G. Uninterruptible Power Supply (UPS)
   1. Provide a UPS for supporting operator PCs and servers.
   2. UPS shall be sized for 50% spare capacity. The UPS shall be complete with batteries, external bypass and line conditioning.

2.03 OPERATOR'S WORKSTATION

A. The Operator's Workstation (OWS) shall provide the primary means of communication with the BAS and shall be used for operations, engineering, management, audit, reporting and other related functions. The fixed OWS shall consist of PC-based configurations. The fixed OWS shall not function as the web server.

B. At a minimum, an OWS shall consist of a desktop computer PC processor with minimum 64-bit word structure, 1 TB Hard Drive, 3.5 GHz processor, 16.0 GB RAM, 52x R/W CD-ROM, one parallel port, one serial port, one HDMI port, one USB and one USB-C port, and peripheral interface boards as required. Unit shall be complete with:
   1. Keyboard including full upper/lower case ASCII key-set, a dedicated cursor control keypad and a minimum of 15 programmable function keys
   2. Digital Mouse
   3. Full color, 21 inch diagonal, Full HD resolution flat screen monitor supporting minimum 256 colors and a minimum of 1920 x 1080 pixel resolution and minimum 100 Hz refresh rate
   4. High resolution graphic interface board compatible with color monitor and graphic software
   5. Full color inkjet or laser printer
   6. As a minimum, operating system shall be Windows 11.0.

C. Provide a laptop that shall operate identically to the fixed OWS.

D. The network management database shall reside in the fixed and portable OWS and be fully documented and configured prior to project close-out. The BAS Contractor shall keep a duplicate copy of the database for remote trouble shooting capabilities and as a backup.

E. All PCs and laptops shall operate independently and concurrently without interference and under individual user password protection.

2.04 WEB SERVER

A. The BAS contractor shall provide server(s) dedicated to the BAS that will provide archive locations for all historical data such as trends, alarm and event histories, and transaction logs. Equip servers with the same tool set that is located in the Global Control Panels for the system configuration, logic definition and graphic configuration.

B. Access to all information on the server will be through the same user interface used to access individual nodes. When logged onto a server the operator will be able to also interact with any of the Global Control Panels in the facility.

C. The server shall be in the form of supervisory level controllers with integral server or a dedicated PC server separate from the OWS. If more than four supervisory level controllers with integral servers are required to meet the project requirements the temperature controls contractor shall supply a dedicated server for the BAS.

D. Supervisory controller: Device shall be UL 916 listed with power supply, data protection battery, processor, RAM and flash memory, embedded OS and communication ports as necessary for the application. Quantity of controllers shall be determined by the BAS contractor to not significantly limit the operation of the BAS.

E. Dedicated Server: At a minimum, the hardware platform shall consist of a desktop PC processor with minimum 64-bit word structure, 1 TB Hard Drive, 2.8 GHz processor, 16 GB RAM, 52x R/W CD-ROM, one parallel and two serial ports and peripheral interface boards as required. Unit shall be complete and include:
   1. Keyboard including full upper/lower case ASCII key-set, a dedicated cursor control keypad and a minimum of 15 programmable function keys.
   2. Digital Mouse.
   3. Full color, 21 inch diagonal high resolution flat screen monitor supporting minimum 256 colors, front access contrast control and have a minimum of 1280 x 1024 pixel resolution, 0.26 or better dot pitch and minimum 72 Hz refresh rate.
   4. High resolution graphic interface board compatible with color monitor and graphic software.
   5. As a minimum, OS shall be Windows 11.

2.05 USER INTERFACE

A. General
   1. Any computer connected to the Owner's LAN can be designated a user interface point. The user interface shall be color graphic based with text and animation.

2. User access shall be protected by an Owner defined, software-based password access protection. Password protection shall be multi-level with unique access privileges to accommodate the access requirements of different users. Provide the means to on-line manage password access control.
3. The user interface shall be able to combine data from any and all of the system components in a single browser window.
4. The menu driven Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
   a. User access for selective information retrieval and control command execution
   b. Monitoring and reporting
   c. Alarm, non-normal, and return to normal condition annunciation
   d. Selective operator override and other control actions
   e. Information archiving, manipulation, formatting, display and reporting
   f. BAS internal performance supervision and diagnostics
   g. On-line access to user HELP menus
   h. On-line access to current BAS as-built records and documentation
   i. Controlled re-programming, re-configuration of BAS operation and for the manipulation of BAS database information.
   j. Create, delete, or modify control strategies.
   k. Add control loops to the system.
   l. Add/delete points to the system.
   m. Assign sensors and/or actuators to a control strategy.
   n. Tune control loops through the adjustment of control loop parameters.
   o. Enable or disable control strategies.
   p. Enable internet access for remote monitoring and control.
5. Provide reports and displays using simple English language descriptions and readily understood acronyms, abbreviations and the like. All text naming conventions shall be consistent in their use and application throughout the BAS.

B. Navigation Trees: The system will have the capability to display multiple navigation trees. At minimum, provide a tree that identifies all systems on the networks. Provide the ability for the operator to add custom trees.

C. Alarms
1. The BAS shall be capable of routing specific alarms from specific points to specific computers and servers. Alarm management shall include:
   a. Log date and time of alarm occurrence.
   b. Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
   c. Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
   d. An audit trail for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
   e. Direct alarms to an e-mail address or alpha-numeric pager. This must be provided in addition to the pop up window described above
   f. Any attribute of any object in the system may be designated to report an alarm.

g. Alarm lockout software shall be provided to prevent nuisance alarms. On initial start-up of other mechanical equipment, a "timed lockout" period shall be assigned to analog points to allow them to reach a stable condition before activating alarm comparison logic. Lockout period is to be programmable on a per point basis from 0 to 90 minutes in one minute increments.

D. Reports: BAS shall be capable of having user defined reports generated and directed to any or all, at the user's option, user interface displays, printers, or archive.

E. Graphical User Interface via Dynamic Color Graphics
1. An unlimited number of graphic displays shall be able to be generated and executed.
2. Values of real time attributes displayed on the graphics shall be dynamic and updated on the displays.
3. The graphic displays shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.
4. The user shall be able to change values (setpoints) and states in system controlled equipment directly from the graphic display.
5. Provide a graphic editing tool that allows for the creation and editing of graphic files. It shall be possible to edit the graphics directly while they are on line, or at an off line location for later downloading. The graphics editor shall allow zones of the building, mechanical systems, floor plans, etc., to be custom generated for the project.
6. System shall be provided with a complete user expandable, industry standard, symbol library for graphic generation containing all of the basic symbols used to represent components of a typical BAS system.
7. Provide a DLL Software driver to dynamically map LonTalk® SNVT's into the Window based graphics application.

F. Scheduling
1. Provide scheduling capability that will initiate events for execution at a specific day, time or upon the occurrence of an event. Program features include:
   a. Analog points commanded to a specific value.
   b. Digital points commanded to a specific state.
   c. Manual initiation via operator's command.
   d. Commands must honor sequence commanded delays.
   e. Commands must honor commanded and residual priority structures allowing higher priority commands to override lower priority commands and residual priority.
2. The system shall provide multiple schedule input forms for automatic time-of-day scheduling and override scheduling of operations. The following types shall be accommodated:
   a. Weekly schedules.
   b. Temporary override schedules.
   c. Special "Only Active If Today Is A Holiday" schedules.
   d. Monthly schedules for a twelve (12) month period.
3. Schedules shall be provided for each system or sub-system in the BAS. Each schedule shall include all commandable points residing within the system. Each point may have a unique schedule of operation relative to the schedule, allowing for sequential starting and control of equipment within the system.

G. Historical Trending and Data Collection
1. Trend and store point history data for all points and values as selected by the user on system hard drives.
2. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools.
3. Provide the capability to perform statistical functions on the historical database:
4. Trended data shall be capable of automatic retrieval as a data file in the most current version of Microsoft Excel.
5. The software shall allow analog and digital values and calculated results to be graphically plotted in real-time or historical format.
6. Provide a supervisory program to permit the operator to archive trended data when the memory capacity begins to reach the installed limits.

H. Paging:
1. Provide the means of automatic alphanumeric paging of personnel for user-defined BAS events.
   a. System shall support both numeric and alpha-numeric pagers, using Alphanumeric, PET, or IXO Protocol at the Owner's option.
   b. Users shall have the ability to modify through the system software the phone number or message to be displayed on the pager.
   c. System shall utilize pager schedules to send pages to the personnel that are "on-call." BAS Contractor shall be responsible for providing a modem for connection to the paging service.

I. HVAC Application Software
1. Event Messaging: Provide for the automatic execution of user-defined messages on the occurrence of predefined real-time events.
2. Optimum Start: Provide software to start equipment on a sliding schedule based upon indoor and outdoor conditions, to determine the minimum time of HVAC system operation needed to satisfy the space environmental requirements. The optimum start/stop program shall operate in conjunction with, and be coordinated with, the scheduled start/stop and night setback programs.
3. Auto Alarm Lockout: Provide for scheduled and automatic lockout of alarm annunciation from equipment during non-normal operating conditions including shutdown, emergency power operation, fire alarm, and the like.
4. Energy monitoring: Provide software to monitor and totalize consumption as measured by pulse meters.
5. Event Initiated Programs and custom logic: Provide software to define custom logic sequences that will reside in the nodes.
6. System Restart.
7. Heavy Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
8. Runtime Totalization for binary input and output points.
9. Analog/Pulse Totalization for user-selected analog and binary pulse input-type points.

2.06 GLOBAL CONTROL PANEL (GCP)

A. General Requirements
1. The GCP shall monitor all system variables including real hardware points, software variables, and controller parameters such as setpoints. The GCP shall be solid state devices equipped with only non-volatile memory (flash or EEPROM). GCP shall be programmable and governed by the requirements of their applicable codes, approvals, and regulations. The GCP shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. Components shall be standard, proven products of their original manufacturer and not a custom product for this Project.
2. The GCP residing on the Tier 1 network shall be equipped with all software necessary. The operating system of the GCP shall support multi-user access.
3. The GCP shall manage and direct all information traffic on the Tier 1 network, between the Tier 1 and Tier 2 networks and to servers. Communication between GCP and OWS shall be peer-to-peer via 10/100 Ethernet using the BACnet TCP/IP protocol. The GCP shall be capable of direct connection to multiple field busses using different protocols simultaneously. The GCP will integrate data from multiple field busses. Data from all field busses will appear in common displays throughout the user interface in exactly the same format.
4. GCP shall comply with FCC Part 15 Subpart J Class A emission requirements.
5. A failure shall not cause failures or non-normal operation at any other system node other than the possible loss of active real-time information from the failed node. The node shall continue complete operation, including all safeties, in the event the local operating network communications is lost.
6. Provide Controllers with diagnostic indicators for transmit, receive, power up test, power up fail, power up test okay and bus error.
7. The GCP shall be equipped with a clock battery. The battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two week period.

B. Miscellaneous:
1. GCP shall be equipped with power supply, input/output modules, termination blocks, network transceivers, On/Off switch with over-current and transient power protection.
2. If the graphic user interface software resides in the GCP (i.e., the GCP is the network server), each GCP shall be equipped with the necessary un-interruptible power such that it will not cease operation during minor power outages, including those that occur upon transfer to emergency generator or other local power source not provided by the utility.
3. Ancillary equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity at the point of design.
4. The complete GCP including accessory devices such as power supplies, interfaces, etc., shall be mounted, wired, and housed in a NEMA 1 enclosure for plenum location or as required by the local code requirements.

2.07 APPLICATION SPECIFIC CONTROLLERS

A. General Requirements
1. The Application Specific Controller (ASC) shall provide both standalone and networked direct digital control of HVAC systems. Each HVAC node shall retain program, control algorithms, and setpoint information in non-volatile memory (EEPROM or Flash) in the event of a power failure, and shall return to normal operation upon restoration of power. The controller shall continue complete operation, including all safeties, in the event the local operating network communications is lost.
2. A dedicated ASC shall be configured and provided for each primary HVAC system (air handler, chiller, boiler) and each terminal HVAC system (VAV box, unit heater, fan coil unit, cabinet heater, heat pump, fan powered box, CV box). Provide means of indication of system performance and setpoints at or adjacent to the ASC. Provide a means to adjust setpoints and start/stop equipment controlled by the ASC. Provide a means to prevent unauthorized personnel from accessing setpoint adjustments and equipment control functions.
3. Each ASC shall report its communication status to the GCP. The GCP shall provide a system advisory upon communication failure and restoration. The ASC shall provide the ability to download and upload configuration data, both locally at the node and via the BAS communications network using protocol as specified herein.
4. The ASC shall be provided with a permanently-mounted local graphic terminal where required in the sequences of this specification. The local graphic terminal shall provide dynamic graphical representation of the associated system status, with the ability for the operator to enter commands with proper password protection.
5. Provide Controllers with diagnostic indicators for transmit, receive, power up test, power up fail, power up test okay and bus error.
6. The ASC shall be equipped with a clock battery. The battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two week period.

B. Miscellaneous:
1. ASC shall be equipped with power supply, input/output modules, termination blocks, network transceivers, On/Off switch with over-current and transient power protection.
2. Ancillary equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity at the point of design.
3. The complete ASC including accessory devices such as power supplies, interfaces, etc., shall be mounted, wired and housed in a NEMA 1 enclosure for plenum location or as required by the local code requirements.

C. Input/Output Requirements
1. The Input/Output (I/O) module back panel shall be designed to accept inputs or outputs in any combination and be modified to accept phased additions or changes to the panel point configuration. The I/O capacity shall meet the requirements of the specification plus 20% reserve capacity at the point of installation. The reserve capacity shall be in the form of additional I/O spaces in the panel. Actual modules are not necessary. If the modules/back panels are not universal, the 20% rule shall be applied to each module type.
2. All Inputs shall be Universal type capable of handling current, voltage, resistance, or open and closed contacts in any mix. Analog current (4-20 mA and 0-100 mA) and voltage inputs (0-1 volt, 0-5 volt, 0-10 volt, and 2-10 volt) shall be supported.

3. Each digital output module shall be equipped with 3 position override switch (auto-off-on) for manual operation. Analog output modules shall be equipped with a 2 position override switch (manual-auto) and a built-in potentiometer.
4. Thermistor type temperature sensors shall have a programmable calibration constant unique to a specific resistance group.
5. Normally open contacts (24 volts and 120 volts), normally closed contacts (24 volts and 120 volts), current/no current and voltage/no voltage type digital inputs shall be supported by the ASC.
6. The ASC shall accommodate both digital and analog outputs. Voltage (0-12 volts) and current (4-20 mA) outputs shall be accommodated. All analog outputs shall be proportional current or voltage type with a minimum incremental resolution of 0.5% of the full operating range of the actuating device (not 0.5% of 0-12 volts output). Match the proportional range of the output to the full operating range of the actuating device. Use zero and maximum output voltage or current values for shutdown and close-off modes. For troubleshooting and load analysis, the value of each analog output shall be available in the database for trending and display.
7. Digital outputs shall be capable of handling maintained as well as pulsed output for momentary or magnetic latching circuits. It shall be possible to configure outputs for 3-mode control (fast-slow-off) and 2-mode control.

D. ASC Software
1. Point Processing Software shall:
   a. Update values at a maximum of one second intervals.
   b. Retain in memory the maximum and minimum values sensed for each analog input.
   c. Discard analog inputs based on reasonability check against previous values.
   d. Assign engineering units and status condition identifiers to all points.
   e. Assign priority to commands.
   f. Execute commands based on highest priority first.
   g. Maintain last user record to identify which command is in control.
2. Control Loops: Provide standards and custom programs to perform the specified sequence of operation. Control loops shall include Proportional Control, Proportional plus Integral (PI), Proportional plus Integral plus Derivative (PID), and Adaptive Control (self-learning). The execution interval of each loop shall be adjustable from 2 to 120 seconds in one second increments.

2.08 ELECTRICAL CONTROL POWER AND LOW VOLTAGE WIRING

A. BAS Wiring
1. All conduit, wiring, accessories, and wiring connections required for the installation of the BAS shall be provided by the BAS Contractor unless specifically shown on the Electrical Drawings. All wiring shall comply with the requirements of applicable portions of the requirements for Electrical Work contained in these Specifications, and all local and national electric codes, unless specified otherwise in this section.
2. The sizing type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BAS Contractor.

B. DDC System Network Communication Requirements
1. At minimum, network communication shall be via Category 5 twisted pair in a plenum approved raceway or insulation.

C. Power and Communication Wiring Transient Protection
1. Submit catalog data sheets providing evidence that all products offered by the manufacturer are tested and comply with the standard for Transient Surge withstand capabilities for electrical devices ANSI C62.41, IEEE-587-1980, Categories A and B. Such testing shall have included power and communication trunk wiring. Compliance with IEEE-587 shall imply conformance with IEEE-472 transient standards based on the stated position of ANSI and IEEE regarding applicability of the rated standards.
2. Communications trunk wiring shall be protected with a transient surge protection device providing the minimal protection specifications of the General semiconductor, Model #422E device.
3. The communications circuitry, input/output circuitry, and nodes shall provide protection against a 1,000 volt, 3 amp transient signal, directly applied to the communication or input/output terminations. The manufacturer's catalog data sheet shall provide evidence of conformance with this requirement. Systems not complying with this requirement shall provide equivalent protection external to the node. Protection shall be provided for the individual communications and input/output terminations for each node. Submittal documentation shall clearly define how this requirement will be met and how the external protection will not affect the performance of the controllers.

D. Input/Output Control Wiring
1. RTD wiring shall be three-wire or two-wire twisted, shielded, minimum number 22 gauge.
2. Other analog inputs shall be a minimum of number 22 gauge, twisted, shielded.
3. Binary control function wiring shall be a minimum of number 18 gauge.
4. Analog output control functions shall be a minimum of number 22 gauge, twisted, shielded.
5. Binary input wiring shall be a minimum of number 22 gauge.
6. Thermistors shall be equipped with the manufacturer's calibrated lead wiring.
7. 120 volt control wiring shall be #14 THHN in 3/4 inch conduit. Provide four (4) or 20% fill extra wire in each conduit.
8. Low voltage lighting control wiring shall be a minimum of number 22 gauge, twisted, shielded pair in a plenum approved raceway or insulation.

E. Splices
1. Splices in shielded cables shall consist of terminations and the use of shielded cable couplers which maintain the integrity of the shielding. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties as specified herein.

F. Conduit and Fittings
1. Conduit for Control Wiring, Control Cable, and Transmission Cable: Electrical metallic tubing (EMT) with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connections.
2. Outlet Boxes (Dry Location): Shereadized or galvanized drawn steel suited to each application, in general, four inches square or octagon with suitable raised cover.
3. Outlet Boxes (Exposed to Weather): Threaded hub cast aluminum or iron boxes with gasket device plate.
4. Pull and Junction Boxes: Size according to number, size, and position of entering raceway as required by National Electrical Codes. Enclosure type shall be suited to location.

5. Exposed conduit in kitchen locations shall be chrome plated and meet the requirements for Electrical Work contained in these Specifications.

G. Relays
1. Relays other than those associated with digital output cards shall be general purpose, enclosed plug-in type and protected by a heat and shock resistant dust cover. Number of contacts and operational function shall be as required.

2.09 FIELD DEVICES

A. Dampers (Multiple Blade Dampers)
1. Automatic dampers shall be single or multiple blade. All dampers are to be sized to the application by the BAS Contractor using methods similar to control valve sizing.
2. Frames shall be 16 gauge galvanized steel structural channel and shall have flanges for duct mounting as appropriate.
3. Blades shall be 14 gauge galvanized steel, roll-formed air foil type not exceeding 8 inches wide.
4. Damper bearings shall be permanently lubricated, stainless steel type. Dampers hung with blades mounted vertically shall be provided with thrust bearings.
5. Each blade and top and bottom of frame shall have replaceable butyl rubber seals suitable for -80 to 300 degrees F. Seals shall be mechanically locked into blade slots.
6. Jamb seals shall be flexible metal compression type.
7. Maximum damper leakage shall be 8.0 cfm/sf at 4 inch static pressure
8. Damper sections shall not exceed 16 sq. ft. and shall have minimum of one operator per damper section.
9. All dampers in modulating applications shall have opposed blades. Dampers in two position services shall have parallel blades.
10. Submittals shall include damper sizes and leakage characteristics.
11. Return air dampers shall be smoke rated dampers.

B. Electronic Actuators
1. General
   a. Actuators shall be sized sufficiently to operate the controlled device throughout its range of movement and provide adequate power to closed the controlled device against system differential pressures. Actuator shall be sized for 150% of required duty. Actuators may be mechanically and electrically paralleled on the same shaft to multiply the available torque.
   b. Actuators shall accept 24 VAC or VDC power supply and be UL listed, direct coupled type capable of being direct mounted over the shaft of the controlled device. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of each actuator shall be wired back to a terminal strip in the control panel.
   c. Power consumption shall not exceed 8 watts or 15 VA of transformer sizing capacity per high torque actuator nor 2 watts or 4 VA for VAV actuators. Sound level shall not exceed 45 dB for high torque nor 35 dB for VAV actuators.
   d. Electronic overload protection shall protect actuator from damage. If device jams, the actuator shall not burn out. Internal end switch type actuators are not acceptable.

e. A reversing switch shall be provided to change action from direct to reverse in relation to control signal as operation requires. Actuator shall also have manual override, field selectable rotational/spring return direction, field adjustable zero and span. Actuator (except for Generator intake/exhaust) shall cycle in ninety (90) seconds maximum end to end full stroke, fifteen (15) seconds maximum return to normal for spring return.

2. Electronic Damper Actuators
   a. Damper sections shall be sized and coordinated based on actuator and dampers manufacturer's recommendations based on face velocity, differential pressure and damper type.
   b. All damper actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. Actuators for terminal units shall fail to last known value.
   c. Damper actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.
   d. Provide auxiliary adjustable end switches on damper shaft or blade switch to prove damper position as required by the sequence of operations.

C. Temperature Sensors, Nodes and Transmitters
1. General Requirements
   a. Provide sensors, nodes, and transmitters as required by the sequence of operation.
   b. Temperature transmitters shall be equipped with non-interactive, individual zero and span adjustments for calibration without iterative operations.
   c. Each temperature sensor shall match the requirements of the associated temperature controller. Each sensor shall be designed for the appropriate application (i.e., duct, immersion, etc.) and be provided with all necessary installation accessories. Ranges shall be selected to the middle of the control range. The BAS shall be equipped with a self-calibrating feature for temperature sensors.
   d. Temperature transmitters shall be sized and constructed to be compatible with the medium monitored. Transmitters shall be equipped with a linearization circuit to compensate for non-linearities of the sensor and bridge and provide a true linear output signal.
   e. Temperature sensors shall be resistance type and shall be three-wire 100 ohm platinum RTD, or two-wire 1,000 ohm platinum RTD, wound nickel or thermistor type.
   f. Thermistors shall have a minimum of 100 ohm/degrees F resistance change versus temperature. Thermistors shall be certified to be stable + 0.24 degrees F over five (5) years and + 0.36 degrees F accurate and free from drift for five (5) years. Thermistors are acceptable provided BAS can compensate for the mathematical variation of the fitting constraints and that accuracy can be obtained.
   g. The following accuracy's are required and include errors associated with the sensor, lead wire and A to D conversion.

Point Type	Accuracy
Temperature	1.00°F
Duct Temperature	1.00°F

2. Room Sensors and Nodes
   a. Room temperature sensors are to be provided with a screw cover.

b. Terminal unit temperature sensors shall be RTD 1,000 Ohm Platinum, 2 wire, accurate to + 0.5 degrees F at room temperature with 12 Bit A to D resolution. Provide sensor with / without room temperature indicator and with / without setpoint adjustment. Adjustment shall be +/- 3 degrees from setpoint in the BAS.
c. Sensor shall be supplied with a vertical base for mounting on a standard single gang junction box.
d. Provide an integrated 3150® Neuron® chip and FTT-78 Transceiver. Comply with the most current published LonMark® functional profile for sensors.

3. Outside Air Sensors
   a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
   b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate surrounding the sensor element.
   c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
4. Duct Type Sensors
   a. Duct mount sensors shall mount in a hand box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (Sealtite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.
   b. Duct sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate. Duct sensor probe shall be constructed of 304 stainless steel.
   c. Where a device is used for sensing of mixed air temperature and the duct or air handler cross-sectional area is in excess of 14 square feet, the instrument will incorporate an averaging element with a minimum length of 96 inches or a suitable array of duct sensors wired as a single input. Provide capillary supports at the sides of the duct unit to support the sensing string.
   d. For outdoor air duct applications, use a weatherproof mounting box with weatherproof cover and gasket.

D. Relative Humidity Sensors/Transmitter
1. The relative humidity sensor shall be solid state, resistance type sensor of the Bulk Polymer Design, Class 2. The sensor element shall be washable and shall resist surface contaminations.
2. Transmitter shall be equipped with non-interactive span and zero adjustments, a 2 wire isolated loop powered, 0-10vDC, 4-20ma, linear proportional output.
3. The humidity transmitter shall be accurate to ±2% RH, including lead loss and A to D conversion. Range shall be 20% to 80%.
4. Acceptable Manufacturers: HyCal, General Eastern or Mamac.

E. Humidistats shall have SPST switching which makes on a fall in relative humidity. The sensing element shall be moisture sensitive nylon ribbon wound around three bobbins to give four element control. Provide removable setting knob to prevent tampering.

F. High Limit Humidity Controller: Duct mounted air sampling tube with nylon element for sampling humidity within the duct. Setpoint range 65% to 95% RH in 5% increments. Operable up to 125 degrees F.

G. Pressure Sensing Devices
   1. General Requirements:
      a. Sensing elements shall be corrosion resistant, bourdon tubes, bellows, or diaphragm type.
      b. Units shall have tamper-proof adjustable range and pressure settings and shall provide an output signal of 0 to 10V dc, or 4 to 20 mA.
      c. The sensing range and mounting of the device shall be as appropriate for the application and system design.
      d. Pressure devices shall be constructed to withstand a minimum of 100% over pressure without damage and to hold accuracy during a momentary 40% over-range input.
      e. Mount the sensing element within 20 feet of the pick up point. Locate transmitters in accessible location and in control panels wherever possible.
      f. Devices shall be furnished by the BAS contractor and mounted in the duct or pipe by the HVAC Contractor.
      g. Provide a minimum of a NEMA 1 construction for the transmitter.
      h. Acceptable Manufacturers: Mercoid, Dwyer, or McDonnell Miller.
   2. Differential Pressure Switches
      a. Switch contacts shall be snap action micro-switch type Form C contact.
      b. Assembly shall operate automatically and reset automatically when conditions return to normal. Complete sensor assembly shall be protected against vibration and movement.
      c. High pressure switches shall be manual reset devices.
      d. Switches shall be vented to withstand a 50% over-pressure without loss of calibration.
   3. Differential Pressure Transmitters used for flow measurement shall be sized to the flow sensing device and shall be supplied with shutoff and bleed valves in the high and low sensing pick-up lines (3 valve manifolds).

H. Temperature Control Cabinets: Controls shall be mounted in standard control cabinets, size as required, with hinged key locking door. Unit is to be piped and wired to numbered terminal strips. Items within panels shall be neatly labeled to identify them with respect to the control schematics. All control wiring and system communications shall be electrically terminated inside the cabinet.

I. Electronic Room Thermostats: A modulating solid state controller with built-in detector, P or PI controller, as required, with continuous voltage or current output. Each unit shall have individual setpoint, proportional band, start-point, and span adjustments. Input voltage shall be 24 VAC or less. Provide each unit with night setback, summer/winter switch over, or remote reset capabilities, as required.

J. Programmable Electronic Thermostats: A modulating solid state controller with built-in detector, P or PI controller, as required, with continuous voltage or current output. Each unit shall have individual setpoint, proportional band, start point, and span adjustments. Input voltage shall be 24 VAC or less. Provide each unit with night setback, summer/winter switchover, or remote reset capabilities, as required. Thermostat shall have a seven (7) day four (4) time sequence programmable schedule.

K. Electric Room Thermostats: Heavy duty snap action type with key operators rated at 6 FLA at 120 VAC contacts suitable for the intended service. Provide manual selector switches as required in the sequence of operation.

L. Low Limit Detection Thermostats: Low limit detection thermostats shall be of the vapor tension capillary type having a sensing element a minimum of 20 feet in length. These thermostats shall be manual reset type. The elements shall be complete with necessary fittings to permit installation in the duct or AHU to sense the correct discharge temperatures. One (1) low limit detection thermostat will be installed for every 20 square feet of protected area and arranged to sequence unit as described when sensed temperature falls below 38 degrees F.

M. Thermostat guards shall be provided where specified, indicated on control diagram, or indicated on floor plans. Guards shall be firmly attached to wall and thermostat cover shall be visible through guard. Covers shall be clear Lexan. Opaque covers shall be provided where specified.

2.10 SYSTEM HARDWARE IDENTIFICATION

A. Wire Tags
1. All multi-conductor cables in all pull boxes and terminal strip cabinets shall be tagged.
2. Provide wire tags as per the requirements for Electrical Work contained in these Specifications.

B. Conduit Tags
1. Provide tagging or labeling of conduit so that it is always readily observable which conduit was installed or used in implementation of this Work.

C. Miscellaneous Equipment Identification
1. Screwed-on, engraved black lamicoid sheet with white lettering on all control panels, remote processing panels and items inside panel. Lettering sizes subject to approval.
2. Inscription, subject to review and acceptance, indicating equipment, system numbers, and for panel interior wiring, input/output modules, local control panel device identification.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install all control components in accordance with manufacturer's instructions and recommendations.

B. Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. Verify panel locations and space availability prior to submission of shop drawings. The panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.

C. Do not install electronic hardware until appropriate environmental conditions have been established. Products installed in violation of this requirement shall be replaced at no additional cost to the project.

D. Coordinate storage requirements for factory mounted terminal control units on air terminal devices.

E. Each electrical field wire shall be labeled or coded at each end to show location of the opposite end. Each point of all field terminal strips shall be permanently labeled or coded. Color coded cable with cable diagrams may be used to accomplish cable identification and terminal strip identification.

F. Provide temperature and humidity sensor guards in areas noted on the Drawings. Guards shall be firmly attached to the walls.

G. All system components exposed to the natatorium, locker room, and pool equipment room environments shall be corrosion resistant.

H. Penetrations
1. Provide firestopping for all penetrations though all fire proofed or fire stopped components used by dedicated BAS conduits and raceway. All openings in shall be closed using approved fire resistive sealant.
2. All wiring passing through penetrations, including walls, shall be in conduit or enclosed raceway. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
3. No penetrations in structural elements shall be made before receipt of written approval from the architect.

I. Outside Air Sensors shall be mounted on the North wall or located in a continuous intake flow adequate to monitor outside air conditions.

J. Building Differential Air Pressure Transmitter's exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind. The interior tip shall be in an inconspicuous location.

K. HVAC Output Devices
1. All output devices shall be installed per manufacturer recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, etc.
2. Electronic Signal Isolation Transducers: Whenever an analog output signal from the BAS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems.

L. Graphic Displays
1. Provide a color graphic system flow diagram display for each system with all points indicated. Provide Historical Data Viewer functionality.
2. Provide a color graphic display for each floor in the facility. Indicate each HVAC zone, color coded to indicate zone values and status. Provide Historical Data Viewer functionality. Each floor plan shall include room numbers matched to the final room numbering scheme. Note that these may not be the same as the contract documents and shall be updated as part of the project at no cost.
3. User shall penetrate from floor plan to associated HVAC system graphic.

3.02 ELECTRICAL SYSTEM INSTALLATION

A. Provide electrical wiring for relays (including power feed) and for temperature and pressure indication.

B. Provide power wiring, conduit and connections for low temperature thermostats, high temperature thermostats, alarms, actuating devices and for all temperature, humidity and pressure sensors. Conduit shall be continuous from the controller enclosure to the field device.

C. Provide all other wiring required for the complete operation of the specified systems.

D. Run all wiring raceway systems complying with the requirements of the National Electrical Code. All installations shall be installed in EMT or plenum rated cables.

E. Conceal conduit within finished shafts, ceilings and wall as required.

F. Plug or cap all unused conduit openings and stub-ups. Cap open ends of conduits until conductors are installed. Do not use caulking compound.

G. Route all conduit to clear beams, plates, footings and structure members. Do not route conduit through column footings or grade beams. All exposed conduit and cable shall be parallel/perpendicular to building lines.

H. Penetration through outside foundation walls shall be sealed watertight with oakum and lead.

I. Where conduit is attached to vibrating or rotating equipment, flexible metal conduit with a minimum length of 18 inches and maximum length of 36 inches shall be installed and anchored in such a manner that vibration and equipment noise will not be transmitted to the rigid conduit.

J. Where exposed to the elements or in damp or wet locations, waterproof flexible conduit shall be installed. Installation shall be as specified for flexible metal conduit.

K. Provide floor, wall, and ceiling plates for all conduits passing through walls; floors or ceilings. Use prime coated cast iron, split-ring type plates, except with polished chrome-plated finish in exposed finished spaces.

L. Class 2 Wiring (24VAC or less)
   1. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5 feet from the building structure utilizing metal hangers designed for this application. All wiring shall be installed in accordance with local code requirements.
   2. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
      a. All circuits shall be continuous and free from short circuits and grounds. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms. All circuits are free from induced voltages.
      b. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.

c. Provide for complete grounding of all signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

M. BAS Line Voltage Power Source
1. 120 volt AC circuits used for the BAS shall be taken from panelboards and circuit breakers or junction boxes provided by the Electrical Contractor. Transformers shall be provided by the BAS contractor.
2. Circuits used for the BAS shall be dedicated to the BAS and shall not be used for any other purposes.
Fan-powered terminal unit controllers may use AC power from motor power circuits.

N. BAS Raceway
1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2 inch.
2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.

O. In all communication conduits, provide one (1) spare twisted pair to be installed, tagged and labeled at each end.

P. Telephone lines, where required as a remote communication source, shall utilize voice band, non-switched, private line channels consistent with local telephone systems and shall be four-wire unconditioned 3,002 channels. The modems shall have twenty-five (25) pin EIA connectors and RS-232C interface.

Q. Communication conduits shall not be installed closer than 6 feet from high power transformers or run parallel within 6 feet of electrical high power cables. Care shall be taken to route the cable as far from interference generating devices as possible.

R. All shields shall be ground (earth ground) at one point only, to eliminate ground loops.

S. There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, all communication wiring and signal wiring shall be run using separate twisted pairs (24-awg) in accordance with the manufacturer's wiring practices.

3.03 INSTRUCTION OF OWNER OPERATING PERSONNEL

A. All training at the site shall utilize specified manuals, as-built documentation, and the on-line help utility. All training sessions shall be videotaped with professional quality video camera and a dubbing/editing recorder. Submit two copies of the training session(s) prior to project contract completion.

B. All Man Machine Interface Training (DOS, Windows, GUI, etc.) shall be provided by a professional trainer utilizing interactive computer screen projection and capabilities to train two members of the Owner operating staff with PC's of similar style and processing capabilities as the operator's terminal.

C. The initial operator training program shall be to establish a basic understanding of Windows based software, functions, commands, mouse, etc. The training shall encompass as a minimum:
   1. Purge and/or dump of historical data.
   2. Use of OWS.
   3. Troubleshooting of input devices, i.e., bad sensors.
   4. Sequence of operation review.
   5. Sign on - sign off.
   6. Selection of all displays and reports.
   7. Commanding of points, keyboard and mouse mode.
   8. Modifying English text.
   9. Use of all dialogue boxes and menus.
   10. Modifying warning limits, alarm limits and start-stop times.
   11. System initialization.
   12. Download and initialization of remote panels.
   13. Basic Windows (latest versions) Training.
   14. User Interface software.
   15. Network Management.

D. Upon completion of the work and acceptance by the Owner, provide six four-hour periods of instruction to the Owner's operating personnel who have responsibility for the mechanical system. Provide two periods of training at the end of Construction Phase and two periods at the beginning of the first winter, and the remaining two at the beginning of the first summer. The Control Manufacturer shall make available to the Owner regularly scheduled training courses for the ongoing training of the Owner's operating personnel.

3.04 ACCEPTANCE PROCEDURE

A. Upon completion of the installation, Contractor shall start up the system and perform all necessary calibration and testing to ensure proper operation of the project mechanical systems.

B. Schedule a hardware demonstration and system acceptance test in the presence of the Owner's representative. The acceptance testing is defined as demonstrating the specified sequence of operation. The Contractor shall perform tests prior to scheduling the acceptance test and hardware demonstration to insure the overall system is ready for inspection and observations.

C. When the system performance is deemed satisfactory by these observers, the system will be accepted for beneficial use and deemed substantially complete.

D. System Acceptance: The BAS Contractor shall issue a report upon project completion stating that the system is complete, has been adjusted, and is operating in accordance with the Specifications. Any deviations from specified settings or operations necessitated during system adjustment shall be specifically noted.

3.05 COMMISSIONING

A. Fully commission all aspects of the Building Automation System work.

B. Acceptance Check Sheet
   1. Prepare a check sheet that includes all points for all functions of the BAS
   2. Submit the check sheet to the Engineer for approval one month prior to testing.
   3. Complete the check sheet for all items and functions of the BAS and initial each entry with time/date as record of having fully calibrated and tested the BAS. Submit to Engineer.
   4. The Engineer will use the check sheet as the basis for acceptance testing with the BAS Contractor.

C. Provide all necessary specialist labor, materials, and tools necessary to demonstrate to the Engineer, that the BAS has been commissioned and is operating in compliance with the contract. Prepare a list of noted deficiencies signed by both the Engineer and the BAS Contractor.

D. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

END OF SECTION

SECTION 23 09 93
SEQUENCES OF OPERATION

PART 1 GENERAL

1.01 CONTROL DIAGRAMS AND SCHEDULE

A. Provide a system of controls as required to accomplish the Sequences as hereinafter specified. Refer to the Drawings for information indicating the components and intended control functions and devices.

B. Building Automation System (BAS) Contractor shall be responsible for all control wiring connections, auxiliary devices and control wiring diagrams to complete the control system and attain the described sequence of operation.

C. All set-points of thermostats, controllers and the like, that are not factory preset, shall be preset by the Temperature Control Contractor before system startup.

D. The control system shall be easily expandable as the future equipment is installed with no control component replacements. All main system control panels shall have all inputs and outputs necessary for the future equipment.

E. All temperature and pressure control set-points and time limits shall be adjustable at the BAS OWS.

F. Through stable operation and control and sensor accuracy, the following control points shall be held within the following ranges:

1. General occupied spaces (offices, conferences)	cooling setpoint + 1 degree heating setpoint -1 degree
2. Air handler discharge	+/- 1.0 degrees
3. Ducted Air	±1ºF
4. Outside Air	±2ºF
5. Relative Humidity	±2% RH
6. Airflow (measuring stations)	±5% of full scale
7. Air Pressure (ducts)	±0.1" W.G.
8. Electrical (A, V, W, Power factor)	±1% of reading
9. Carbon Dioxide (CO2)	±50 ppm (accuracy)

G. All temperature sensors in air handling units shall be averaging type sensors to average the reading across the cross-sectional area of the unit. Point type sensors are not acceptable.

H. There are many interrelated control loops that will require tuning and adjustment to prevent "hunting" and excessive modulation. Allow time in the bid proposal for tuning and adjustment based on the actual construction and operation.

1.02 SAFETY INTERLOCKS - GENERAL

A. All safety interlocks shall be hard wired and independent of control system programming software, and electronic controllers. These safety interlocks include the shutdown of equipment items due to low temperatures, shutdown due to lack of combustion air supply and/or proper flue draft for fuel fired equipment, and shutdown due to smoke detection.

B. The Division 26 fire alarm panel shall contain one (1) set of contacts for each air handling unit that the Temperature Control Contractor shall be responsible for wiring through in order to shut down the air handling unit, associated return fans, and associated exhaust fans when smoke is detected by smoke detectors that report through the fire alarm panel. This safety interlock is in addition to smoke detectors located at the air handling unit that are locally hard wired by the Temperature Control Contractor for air system shut down of the air handling unit, associated return fans, and associated exhaust fans.

PART 2 PRODUCTS

2.01 Refer to Section 23 09 23 for applicable products.

PART 3 EXECUTION

3.01 GENERAL

A. Alarms: The system shall have multiple levels of action with each alarm. The BAS contractor shall review each alarm point with the Owner's representative to determine the range of alarms (if not already specified) and the appropriate action of each alarm within the system. The actions include changing colors on the graphic at the OWS, notification on the BAS, mobile device, email, etc.

B. Setpoints: All setpoints in the BAS shall be adjustable within the BAS at the OWS.

C. Air Handling Unit Damper Control: Each damper operator within an air handling unit shall be modulated from its own individual control signal from the BAS. Linkage control or modulation of multiple dampers from a single signal is not acceptable.

D. Air Handling Unit Temperature Sensors: All temperature sensors within air handling units shall incorporate an averaging element with a minimum length of 96 inches or the length needs to provide adequate coverage of the cross-section of the unit. The intent is to provide an average temperature throughout the unit. Provide capillary supports at the sides of the duct unit to support the sensing element.

E. Tuning: Each control loop shall be tuned to eliminate unnecessary rapid changes, hunting and adverse impacts on other control loops.

F. Motor Status: The status of all constant speed motors shall be determined by current sensing devices on the motor leads. The status of all motors with variable frequency drives (VFD) shall be via the fault status alarm on the VFD.

G. Schedule: In consultation with the Owner's Representative, create an operating schedule for all major equipment and systems, and for certain building areas. Some systems, equipment items, or areas will operate continuously, but operating schedule functionality shall be provided for all equipment/systems for future flexibility.

3.02 VRF SYSTEM

A. Prior to the design submittal, the BAS contractor shall meet with the VRF Manufacturer, the design professional and the installing contractor for the purpose of coordinating the interface of the BAS and the VRF control systems to accomplish, as a minimum, the following sequence. This meeting shall be scheduled and lead by the BAS contractor.

B. Occupied/Unoccupied Mode:
1. General: The indoor VRF fan coil units shall operate from space temperature or return air temperature.
2. The occupied/unoccupied cycle shall be initiated by the BAS in accordance with the schedule provided by the Owner. An optimum start time algorithm shall calculate the start time prior to occupancy required to precondition the spaces to the desired occupied cycle space setpoint and the controls will start the system accordingly. This algorithm shall be developed by the BAS contractor if it does not exist in the VRF system controller.
3. All temperature readouts shall be in degrees F
4. Occupied: During occupied times, the BAS shall command the fan coil unit fan to run continuously. The wall mounted local zone controller shall command the fan coil unit to cycle the heating or cooling in its respective spaces to satisfy the occupied space temperature setpoint. The local zone controller shall contain a space temperature sensor and shall be furnished by the VRF manufacturer and installed by the BAS contractor. The setpoint of the space shall be adjustable locally at the local zone control and through the BAS. The fan coil unit shall cycle in response to the room temperature sensor. The unit controller or VRF system controller shall be able to prevent the user from selecting heating/cooling mode of operation. The BAS shall incorporate a five-minute time delay between mode changes.
5. Unoccupied: During unoccupied times, the BAS shall command the fan coil unit fan off. If the space temperature drops below the heating setback setpoint, the BAS will cycle the fan coil unit fan to on and the system to heat. If the space temperature rises above the cooling setback setpoint, the BAS will cycle the fan coil unit fan to on and the system to cool.
6. Override: The space occupant shall, by "pushbutton" on the unit controller, be able to override the unoccupied mode to the occupied mode for an amount of time as set through the BAS. The "pushbutton" will signal the BAS to start a timed occupancy override of the VRF equipment in that space. The room occupant will not be able to cycle the unit back to unoccupied.

C. The mode of operation of the outdoor unit shall be determined by the conditions monitored at the system's local zone controller. The system controls shall modulate the operation of the inverter driven system to provide heating and/or cooling as determined at the VRF Controls.

D. The BAS shall receive all space temperatures sensed by the VRF local zone controller via a BACnet or LON interface, for display in a graphic interface utilizing building floorplans to indicate space temperatures.

3.03 DOAS UNIT

A. The DOAS unit shall operate from its own packaged controls and be fully integrated into the Building Automation system via the packaged BACNet MS/TP interface.

B. System Components
1. Exhaust Fan with EC motor.
2. Pre-Filter bank for both the exhaust air intake and fresh air intake
3. Total Energy Heat Recovery Wheel
4. Heating/Cooling Direct Expansion Coil
5. Modulating Hot Gas Reheat Coil
6. Sub-cooling Coil
7. Supply Fan Array EC motor

C. Schedule: The unit shall operate continuously during occupied hours. The unit shall remain off during the un-occupied hours.

D. System Off State
1. When the unit is off for any reason, the outside air, and relief/exhaust dampers shall be closed. The exhaust fan, the supply fan, shall be off.

E. Start-up
1. The unit will operate to maintain the unit's control temperature as sensed by the control temperature sensor (located downstream of the heat wheel).
2. Start-up – All dampers shall open. The return fans and supply fans shall start first. Both shall run at minimum speed. Once a run status is indicated, the fans shall slowly ramp to maintain their normal setpoint control operation. Fans shall run continuously when the schedule is in occupied mode, except in the Defrost Mode, when the supply fan will turn off as described below.
3. Cooling Mode:
   a. When the control temperature rises above the cooling set point, the compressor will turned on with the reversing valve in the dehumidification position until the control temperature falls below the cooling set point.

   The supply air will be conditioned by the enthalpy wheel and the refrigeration system.
4. Dehumidification Mode:
   a. When the control temperature exceeds the dehumidification set point, the compressor will be turned on with the reversing valve set in the dehumidification position.
   b. The supply air will be conditioned by the enthalpy wheel and the refrigeration system.
5. Heating Mode:
   a. When the control temperature falls below the heating set point, the compressor will be turned on with the reversing valve in the heating position.
   b. The supply air will be conditioned by the enthalpy wheel and the refrigeration system.
6. Airside Economizer Mode:
   a. When the control temperature is between the dehumidification and heating set points, the compressor will be turned off.
   b. The supply air will be conditioned only by the enthalpy wheel.

7. Defrost Mode:
   a. When the low suction pressure switch remains open for 20 min. (adjustable) and the compressor is operating in heat pump mode, the unit will enter the Defrost Mode.
   b. The supply blower and compressor will de-energize for 10 min.
   c. The enthalpy wheel and exhaust blower will continue to run.
   d. When defrost cycle is complete, the unit resumes normal operation.
8. Safeties:
   a. The Compressor shall be locked out if the Drain Pan Overflow switch senses high level and an alarm shall be generated.
   b. Other manufacturer required safeties shall be used to stop the equipment and generate an alarm.

9. Unit System Points:

Type	Description	Quantity	D	M	A	L	G
AI	Supply Air Temperature	1*	X		X	X	
AI	Supply Air Dewpoint Temperature	1*	X		X	X	
AI	Control Temperature (ERW Discharge)	1*	X		X	X	
AI	Supply Air CFM	1*	X		X	X	
AI	Exhaust Air CFM	1*	X		X	X	
AO	Cooling Supply Air Setpoint	1*	X	X			
AO	Heating Supply Air Setpoint	1*	X	X			
AO	Supply Air CFM Setpoint	1*	X	X			
AO	Exhaust Air CFM Setpoint	1*	X	X			
DO	System Enable	1*	X	X			
DO	DOAS Alarm Reset	1*	X	X			
DI	DOAS General Alarm	1*	X		X	X	
DI	Supply Fan Status	1*	X		X	X	
DI	Exhaust Fan Status	1*	X		X	X	
DI	Compressor Status	1*	X		X	X	
DI	Enthalpy Wheel Status	1*	X		X	X	
DI	Cooling Mode Active	1*	X		X	X	
DI	Heating Mode Active	1*	X		X	X	
DI	Economizer Mode Active	1*	X		X	X	
DI	Defrost Mode Active	1*	X		X	X	
DI	Drain Pan Overflow Alarm	1*	X		X	X	
DI	Dirty Filter Alarm	1*	X		X	X	

* Points monitored/controlled from the BACNet Interface

3.04 TERMINAL EQUIPMENT

A. Cabinet unit heaters, horizontal: A wall-mounted temperature sensor, via DDC controller, shall cycle the fan to maintain space temperature requirements.

B. Unit heaters: A wall or unit mounted temperature sensor, via DDC controller, shall cycle the fan to maintain space temperature requirements.

C. Air conditioning units (ductless split systems or packaged): Upon a call for cooling as sensed by the unit-mounted temperature sensor, the factory-supplied control panel shall cycle the compressor and evaporator fan to maintain the room temperature set points. Provide all field control wiring for unit control system for indoor and outdoor components. Provide a temperature sensor to monitor space and to report to the BAS. The BAS shall be alarmed if the temperature exceeds 80 degrees F.

3.05 MISCELLANEOUS

A. Lighting Control: The lighting controller furnished by the electrical contractor shall include a communication port and protocol compatible with the BAS. The BAS contractor shall connect to and wire the lighting controller port to the BAS and integrate the lighting controller to be fully accessible through the BAS.

B. All sensing points of the miscellaneous systems shall be programmed for monitoring and alarms shall report to the OWS.

3.06 TREND REPORTS

A. It shall be possible to trend all BAS data without having to program points or set-up. Trended points and times shall be set in conjunction with the Owner's requirements and the Commissioning Agent. Data storage processes shall be set to maintain this data for time constraints coordinated with the Owner. As a minimum, the following points shall be recorded and stored every thirty minutes:

END OF SECTION

SECTION 23 21 16
CONDENSATION DRAIN AND MAKE-UP WATER PIPING

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a complete piping system for the following:
   1. Condensation drain

PART 2 PRODUCTS

2.01 PIPING

A. Underground condensation drain piping below slab: Polyvinyl chloride plastic pipe (PVC) Schedule 40 (ASTM D1785).

B. Interior piping: Type "L" hard copper tubing (ASTM B88).

2.02 JOINTS AND FITTINGS

A. Underground condensation drain piping below slab: Solvent-cement joints.

B. Interior Piping Copper: Wrought copper socket solder (ANSI B16.22) joints.

C. Copper Press Fitting Joining System
   1. At Contractor's option, and if permitted by local authorities, copper pipe may be mechanically joined by copper or bronze compression fittings. Fittings shall carry a 50-year manufacturer's warranty.
      a. Use shall be limited to systems with maximum operating pressure of 200 psi, and maximum operating temperature of 210 degrees.
      b. Fittings 1/2 inch to 3 inches shall be crimped on both sides of an integral bead containing an EPDM seal. Fittings 2 1/2 inches through 3 inches shall be double crimped, and be fitted with a stainless steel grip ring.
      c. Piping shall be Type "L" copper.
      d. The Contractor shall be trained on the installation of the product by the manufacturer and shall follow the manufacturer's installation instructions.
      e. All valves and specialties must conform to all other requirements of these Specifications.
   2. Material:
      a. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Fittings shall have a feature which allows the installer to quickly and easily identify connections which have not been pressed prior to putting the system into operation.
   3. Acceptable Manufacturers:
      a. Rigid-Viega, Nibco, Apollo, or Anvil]

2.03 SOLDER

A. 95/5 Tin-Antimony (ASTM B32).

PART 3 EXECUTION

3.01 INSTALLATION OF CONDENSATION DRAIN PIPING

A. Provide trapped condensation drain piping from outlets of drain pans of all cooling coils.

B. Install insect screen at outdoor terminations.

C. Provide drain piping from drain valves and overflows.

D. Pitch all condensation lines down a minimum of 1 inch in 8 feet in the direction of flow.

E. Provide full size interior piping cleanouts consisting of plugged tees at all changes of direction and where shown on the Drawings.

F. Contractor shall install top of underground piping cleanouts flush and level with floor. All items not installed flush and level will be removed and replaced by this Contractor at no cost to the Owner.

G. Where cleanouts occur below carpet, provide vandal-proof stainless steel carpet marker.

3.02 INSTALLATION OF MAKE-UP WATER PIPING

A. Coordinate final connection with the Plumbing Contractor.

B. Run piping level.

C. Test at 125 psig for six (6) hours with no drop in pressure.

END OF SECTION

SECTION 23 23 05
REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide refrigerant piping between the indoor units and outdoor condensing units. Install oil and refrigerant charge, and test system.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING

A. Hard drawn, Type "L" copper tubing (ASTM B88), cleaned and capped.

2.02 FITTINGS

A. Wrought copper or wrought bronze fittings (ANSI B16.22) with brazed joints.

2.03 BRAZING ALLOYS

A. 45% Silver/phosphorous, or silver/zinc alloys with a melting point greater than 1,000 degrees F.
   1. Handy and Harmon or Airco Welding Products.

2.04 SERVICE VALVES

A. Henry Type 203 or approved equal.

2.05 FLEXIBLE CONNECTORS

A. Corrugated stainless inner tube with braided outer shield, 200 lb. minimum working pressure, sweat connections.

B. Metraflex, Flexonics, Flexicraft, or Hyspan Precision Products.

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean ends immediately before brazing joints. Plug ends to exclude dirt and foreign matter during construction.

B. Adequately support tubing with consideration for expansion, contraction, and vibration.

C. Provide adequate lift traps for hot gas riser.

D. Maintain a continual flow of inert gas (nitrogen) through the tubing while brazing joints.

3.02 LEAK TESTING

A. After refrigerant piping system is completed, but before insulation is applied, the system shall be thoroughly tested for leaks. Nitrogen at 300 psig may be used for initial test; loss of initial pressure must be zero psig after a duration of four (4) hours.

B. After system is tight, all inert gas shall be evacuated. Full refrigerant charge for proper operation shall be furnished and placed in the system by this Contractor. System shall be leak tested with halide leak detector after installation of refrigerant. All defective materials shall be replaced. Leaking joints shall be completely re-done, and the entire testing procedure performed again.

C. Upon completion of testing, but before insulation is applied, piping shall be inspected by a representative of the governing authority.

END OF SECTION

SECTION 23 31 10
LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies the construction of ductwork for the listed systems when the duct static pressure is 2 inches W.C. or less (positive or negative). Each duct system shall have a single pressure classification, which shall exceed the fan's external static rating listed in the equipment schedules. In cases where an external fan static is not given in the equipment schedules, the pressure classification of the duct system shall exceed the fan's total static rating.

B. Provide ductwork and/or plenums for the following low pressure air systems:
1. Supply air
2. Exhaust air
3. Return air
4. Transfer air

C. Include all turning vanes, extractors, volume dampers, duct access doors, walls and ceiling access panels, flexible connections, flexible duct, duct sealing systems, hangers and supports necessary to complete the indicated and specified system and achieve the desired system operation.

D. The following rectangular ductwork shall be lined for sound attenuation purposes:
1. All return air ductwork to the fan coil units.
2. All transfer air ductwork.

1.02 QUALITY ASSURANCE

A. The listed standards are referenced for the contractor to follow for the construction of ductwork items not specifically addressed in this specification section. This specification takes precedence over the referenced standards.

B. Standards:
1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), National Fire Protection Association (NFPA), and Underwriters' Laboratories (UL).
2. SMACNA "HVAC Duct Construction Standards Metal and Flexible" – 2006 ANSI edition. Construct ductwork to meet all functional criteria defined in the SMACNA standards except where superseded by this Specification. Note: Duct constructions compliant with SMACNA standards that do not meet the minimum duct thickness listed in this Specification are not acceptable.
3. SMACNA "HVAC Air Duct Leakage Test Manual" latest edition.

C. All ductwork and fittings must have a computer generated label affixed to each section detailing all applicable information including the duct dimensions, gage, reinforcement type/class, and connector type of systems manufacturer. In addition, galvanizing thickness and country of origin must be clearly stenciled on each duct section.

D. The Engineer reserves the right to randomly check sheet metal gauges and reinforcing to verify all duct construction is in compliance. Non-conforming material will be replaced by the Contractor at no cost to the Owner.

1.03 SUBMITTALS

A. Submit ductwork fabrication and layout shop drawings in accordance with Section 20 05 15, "Submittals." Coordinate the detailed fabrication drawings with all trades. Coordinate size and location of ductwork with structure, piping, lighting, equipment, conduit, bus ducts, ceiling construction and clear height above ceilings and other items which may present a potential conflict.

B. Layout Drawings shall be at 1/4 inch = 1 foot scale on reproducible media with enlarged sections, elevations, plan drawings, and mechanical room drawings as necessary to ensure a coordinated installation.

C. Provide a written program outlining protection of ductwork from contamination with dirt and procedures for cleaning contaminated ductwork.

D. Submit documentation that the minimum two weeks building 100% outside air flush-out was completed, including dates when the flush-out was begun and completed and what steps were taken to guarantee 100% outside air usage.

E. Submit documentation for the filtration media used during the flush-out period, including filtration media manufacturer's name, model number, and MERV value.

F. Submit documentation that all filtration was replaced immediately, prior to occupancy including filtration media manufacturer's name, model number, and MERV value.

G. Low Emitting Materials Documentation:
1. Provide a cut sheet and a Material Safety Data Sheet for each adhesive used in the building highlighting compliance with Specification requirements.
2. Provide a cut sheet and a Material Safety Data Sheet for each sealant used in the building highlighting compliance with Specification requirements.

1.04 DUCT DIMENSIONS

A. The dimensions indicated on the drawings are the net inside clear dimensions available for airflow.

B. Contractor shall allow for shop-lined or exterior insulation thickness as required and indicate this on the ductwork layout shop drawings.

PART 2 PRODUCTS

2.01 STEEL DUCTWORK

A. MATERIAL
1. Unless noted otherwise, all ducts shall be constructed with G-90 or better galvanized steel conforming to ASTM A653/A653M and A924/A924M Standards, Lock-Forming Quality (LFQ). G-60 galvanized steel is not acceptable.
2. Pre-engineered low pressure duct systems with factory fabricated fittings utilizing gasketed joints are acceptable. "Spiro-safe" by Lindab, "Uni-gasket" by McGill Airflow Corporation, or "Velocity" by Semco.
3. Stainless steel ductwork shall be [Type 304] [Type 316] stainless steel with a No. 2D finish in concealed locations, and a No. 4 finish for exposed locations, conforming to ASTM A-167 and A-480.

2.02 RECTANGULAR DUCT

A. Minimum gauges and duct reinforcement shall comply with the ANSI 2006 edition of the SMACNA Standards, as well as the requirements listed below.
1. No ductwork, regardless of size, shall be less than 24 gauge.
2. There shall be no cross internal reinforcement; all internal reinforcement shall be in the direction of one axis only. If more reinforcement is needed, increase the duct gauge or provide external reinforcement.
3. All ductwork with a side 16 inches or greater and 20 gauge or less thickness with more than 10 square feet of panel area shall be cross-broken or beaded.
4. Bead, crossbreak and reinforce flat surfaces of all fittings the same as straight duct sections.
5. Transverse joints shall not be considered as duct reinforcement unless specifically stated and listed in the SMACNA standard.
6. Rectangular elbows shall be centerline radius, 1.5 times duct width. Short radius (1D) elbows or square throat mitered elbows are only to be used where shown on the drawings. The drawings shall indicate the style of elbow to be provided. Square throat 90 degree elbows shall include turning vanes. Square throat elbows that are less than 90 degrees shall not contain vanes.
7. The following fittings are strictly prohibited: square throat with radius heel elbows, gored elbows, and drop cheek elbows.
8. All rectangular duct fittings shall conform to the gauge and reinforcement requirements indicated for the largest connected straight duct section.
9. Provide opposed multiblade volume dampers in rectangular ducts.
10. Turning vanes shall be double wall with every sixth vane welded to the runner. Provide standard vane spacing of 3.25” with a radius of 4.5”. Different radius or spacing must be submitted for approval.
    a. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct.
    b. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vane shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instructions.
    c. Rails for mounting turning vanes shall have self-locking, friction fit tabs designed to facilitate proper alignment of vanes.

2.03 ROUND DUCT

A. Minimum gauges and duct reinforcement shall comply with the ANSI 2006 edition of the SMACNA Standards, as well as the requirements listed below.
   1. Seam construction shall be spiral seam, lap and rivet or tack weld on 6 inch interval, spot weld on 2 inch interval, continuous butt weld, or lapped and seam welded.
   2. Round elbows shall be radius type, with a centerline radius of 1.5 times the duct diameter, of stamped, pleated, or three-piece segmented construction. Mitered elbows are prohibited unless specifically shown on the drawings.
   3. Provide round volume dampers with wing nuts, hand quadrants, bearings and stiffened blades.
   4. No ductwork, regardless of size, shall be less than 24 gauge.

2.04 FLAT OVAL DUCT

A. Minimum gauges and duct reinforcement shall comply with the ANSI 2006 edition of the SMACNA Standards. All fittings are to be continuously welded construction, or spot welded and bonded.
   1. Seam construction shall be spiral seam, lap and rivet or tack weld on 6 inch interval, spot weld on 2 inch interval, continuous butt weld, or lapped and seam welded.
   2. Round elbows shall be radius type, with a centerline radius of 1.5 times the duct diameter, of stamped, pleated, or three-piece segmented construction. Mitered elbows are prohibited unless specifically shown on the drawings.
   3. Provide round volume dampers with wing nuts, hand quadrants, bearings and stiffened blades.
   4. No ductwork, regardless of size, shall be less than 24 gauge.

2.05 EXPOSED DUCTWORK

A. All ductwork exposed in conditioned spaces shall be provided with a paint-grip galvanized finish or similar mill surface etch treatment for painting. Prime appropriately.

B. Provide tapered wedge (ramp) joint or gasketed fittings on round ducts.

C. Minimize the use of duct sealants. Apply sealants at joints only in a neat and workman-like manner.

2.06 SPLITTER DAMPERS

A. 20 gauge galvanized steel blades welded to square cold-rolled steel operating rod, air tight end bearings with rubber gasket, adjustable locking mechanism.

2.07 DUCT SEALS

A. Seal all duct transverse joints and longitudinal seams to meet SMACNA Seal Class A for 2 inches of static pressure (positive or negative) as a minimum, and so that leakage rates do not exceed those stated in other sections of this specification.

B. Duct Sealant: Liquid seal for joints and seams. Surfaces are to be clean and free from oil, dust, dirt, rust, moisture, or any substance which would interfere with bonding of sealant. Where metal clearances exceed 1/16 inch, several applications are required.
   1. McGill AirSeal Corporation, "United Duct Sealer – Water Based"
   2. Hardcast "Duct-Seal 321"
   3. Ductmate "Proseal"
   4. Products with documented VOC-emission rates meeting LEED guidelines by Dow Corning, Miracle Adhesives, Ductmate Industries, or Surebond, Inc.

2.08 FIELD ERECTED CASING, PLENUMS AND MIXING BOXES

A. Construct all casings and plenums to the pressure class equal to the fan's total static pressure as indicated on the drawings, but for no less than 2 inches static pressure. The casings shall be capable of handling both positive and negative pressures.

B. Seal all pipe penetrations airtight.

C. Panel construction shall be galvanized steel.

D. Drain pans shall be welded stainless steel and shall extend beyond the coil to catch all condensed water (extend a minimum of 6 inches beyond coil). For coils over 30 inches tall provide intermediate drain pans.

E. Provide casing access doors with a minimum of two hinges and two latches. Provide access doors such that filters, dampers, motors, coils and control devices are accessible for service or removal.
   1. Ventlock, Ruskin, or McGill AirPressure Corporation.

F. Seal all joints, seams, duct wall penetrations, and connections in accordance with SMACNA Seal Class A for 2 inches of static pressure (positive or negative) as a minimum. Provide gasketing on all doors and access panels.

G. Insulate all casings, plenums and mixing boxes.

H. Outside air intake plenums behind louvers: panel construction shall be galvanized steel except for the bottom. The bottom of the plenum shall be aluminum or stainless steel and shall be sloped towards the louver to allow for water drainage. Caulk all seams to prevent water leakage. If the plenum is large enough for personnel access, provide external reinforcement for walking support.

2.09 INSULATED FLEXIBLE DUCTWORK

A. Five feet is the maximum allowable length for final connection to supply diffusers in suspended ceilings. Flexible ductwork shall not be used to connect return or exhaust air devices unless specifically indicated on Drawings.

B. All flexible ducts shall be UL-listed for use as flexible air ducts, and rated for 10 inches W.C. positive pressure and 2 inches negative pressure for sizes through 16 inches diameter, from -20 degrees F to +250 degrees F. Flexible ductwork shall be composed of an aluminum and fiberglass or heavy duty polyester and fiberglass core with a steel wire helix, a fiberglass insulating blanket (R6.0), and metalized outer vapor barrier. The flame spread rating shall not exceed 25 and the smoke developed rating shall not exceed 50. Average attenuation across octave bands one through seven, based on 650 FPM velocity through 9 feet of 8 inch duct, shall be 23 dB.

C. Each flexible duct section shall be supported by a minimum of two duct supports and shall not sag more than 1/2 inch per linear feet of duct.

D. Manufacturers: Flexmaster USA Type 5M or Thermaflex M-KC.

2.10 FLEXIBLE CONNECTIONS

A. Flexible duct connector shall be used where ductwork connects to fans of apparatus, or apparatus casing to fans to isolate vibration transfer. Connectors shall be attached in such a manner as to provide an airtight and waterproof seal. Connectors will comply with NFPA 90A, "Installation of Air Conditioning & Ventilation Systems" and NFPA 90B, "Installation of Warm Air Heating & Air Conditioning Systems."

B. Indoor installations shall be of a UL 214 listed, fire retardant Vinyl coated woven nylon or Neoprene coated woven fiberglass fabric. Minimum density of Vinyl is 20 ounces per square yard and rated to 200 degree F. Minimum density of Neoprene is 30 ounces per square yard and rated to 200 degrees F.

C. Outdoor installations shall be of a UL 214 listed UV-resistant Hypalon coated woven-fiberglass fabric. Minimum density 24 ounces per square yard and rated to 250 degrees F.

2.11 DUCT LINER

A. Semi-rigid fiberglass duct liner with flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50 and K=0.23 at 75 degrees F, 1 inch thick.

B. Liner shall have antimicrobial coating.

C. All edges of liner facing in the direction of airflow shall be coated with adhesive or shall have a metal nosing.

D. Mechanical fasteners shall be used to install the liner in addition to the adhesive. Fasteners shall be welded pin and washer or clinching type impact fasteners - galvanized.

E. Remove and replace all liner that is exposed to water during construction.

2.12 BLANK-OFF PANELS

A. Provide 16 gauge, steel or aluminum, double skinned, insulating blank-off panels behind louvers as indicated on the drawings. Sheet metal material shall match louver material. Panel finish and color to match louver. Seal panel joints airtight. Provide panels with a minimum R-value of 6.

2.13 ROUND TAKEOFF FITTINGS

A. Bellmouth galvanized (24 gauge minimum) fitting with neoprene gasket and locking quadrant volume damper with square shaft and shaft extension. Provide insulation guard when used with internally lined ductwork.
   1. Elgen "Bellmouth" fitting or approved equal by Flexmaster USA or Buckley.

B. Conical galvanized (24 gauge minimum) fitting locking quadrant volume damper with square shaft and shaft extension. Provide insulation guard when used with internally lined ductwork.
   1. Elgen "Conical" fitting or approved equal by Flexmaster USA or Buckley.

PART 3 EXECUTION

3.01 INSTALLATION

A. All duct installations and duct construction shall comply with all requirements of this specification and meet or exceed SMACNA standards and recommendations for construction and installation.

B. Provide sweep elbows at all changes of direction in supply, exhaust, and return ductwork. If mitered elbows must be used due to coordination, provide turning vanes in 90 degree elbows only.

C. Seal all duct seams, joints, connections, and duct wall penetrations. Seal all branch ductwork connecting to plenums.

D. Provide a minimum 6 inch flexible connection where ductwork connects to motor-driven equipment. Do not bulge or install on a bind.

E. Provide duct access doors at all fire dampers, smoke dampers, combination fire/smoke dampers, and motor-operated control dampers. Provide ceiling access panel in dry wall or other inaccessible ceiling systems such that fire dampers are serviceable.

F. Keep ductwork tight to underside of structure. Maintain at least 7 inches clear between duct and suspended ceiling construction.

G. Install all dampers and provide blank-off plates to seal frames airtight.

H. Provide volume dampers at all low velocity duct connections. This includes, but is not limited to, duct connections at shafts, takeoffs to submains (serving two or more branch mains), takeoffs to branch mains (serving two or more terminals or outlets), and branches to single terminals or outlets. The fact that some, but not necessarily all, volume dampers are shown on the contract drawings does not relieve the contractor from these requirements. Locate volume dampers in accessible locations.

I. All duct liners shall be secured in place with mechanical fasteners and adhesive spread over the entire contact surface. Pin spacing shall meet or exceed SMACNA requirements.

J. Install flexible ducting only for termination in 5 feet maximum lengths and with only one 90 degree bend at a radius of one duct diameters.

K. Metallic flexible duct shall be attached with at least three (3) #8 sheet metal screws equally spaced around duct circumference, and five (5) #8 screws for ducts over 12 inches in diameter. Locate screws at least 1/2 inch from duct end.

L. Non-Metallic flexible ducts shall be secured with a draw band. On ducts over 12 inches in diameter, position draw band behind a bead in the metal collar.

M. Secure all insulation and vapor barriers on factory-fabricated flexible ducts with a separate draw band, independent of any used for the connection of the flexible duct to the duct collar.

N. Provide duct access doors at all duct smoke detector locations. Coordinate locations with the Electrical Contractor.

O. Galvanizing Repairs – Repair galvanizing damaged by welding, scratches, etc., using cold galvanizing compound.

P. Branch taps off of elbows are prohibited.

3.02 TESTING

A. Test Requirements:
1. Installed ductwork shall be tested prior to installation of access doors, take-offs, etc.
2. The Contractor shall give the Architect, Engineer, and Owner 72 hours notice prior to testing.
3. Any testing conducted without prior notification shall be considered invalid and will be redone at the Contractor's expense.
4. Leak-test all ductwork. Air leakage in any tested section of ductwork shall not exceed that of SMACNA Leakage Class 6 for rectangular duct and Leakage Class 3 for round duct.

B. Recommended Test Procedure: Perform testing in accordance with SMACNA HVAC Air Duct Leakage Test Manual and as follows below. Note that this reference establishes procedures only; and the allowable leakage rates are found in these Specifications.
1. Use a certified orifice tube and its corresponding logarithmic chart for measuring the leakage. Supply fan must have a CFM capacity greater than the allowable leakage in CFM for the section being tested.
2. Define section of system to be tested and blank off.
3. Determine the percentage of the system being tested, on a square foot of surface area basis.
4. Using the percentage determined in Step "3" and the maximum allowable leakage of 2% of the total system volume, determine the allowable leakage (cfm) for the section being tested.
5. Pressurize to 100% of the duct pressure class design pressure and repair any significant or audible leaks.
6. Pressurize again and measure leakage.
7. Repeat Steps "5" and "6" until the leakage measured is less than the allowable defined in Step "4."

C. Document all duct testing and submit testing results as part of "As-Built" documents. Furnish copies of all completed duct testing documentation upon request of the Architect, Engineer, or Owner.

3.03 DUCT CLEANLINESS

A. Cap/seal supply, return, and exhaust air duct openings immediately after fabrication or cleaning. cover all duct ends and openings with a dual polyethylene protective film. Securely affix the film to protect against dirt and debris. Film must be translucent to facilitate inspection of interior surfaces without removing film. Film must have a minimum elongation of 600%, contain no VOC and leave no residue on duct after removal. Ductmate Industries "ProGuard" or approved equal.

B. The area where duct is to be installed shall be clean and dry.

C. Schedule duct deliveries to the job site to match installation timing to avoid excessive storage at the job site.

D. Store any ductwork at the job site in closed trailers or in the immediate area in which it will be installed. Any ducts at the site that have any opening seals damaged or loose are to be re-cleaned per shop cleaning requirements and re-sealed until needed for installation.

E. Protective coverings shall only be removed immediately before installation. Maintain caps/seals on all openings of installed ducts. If openings of installed ducts have their seals damaged or loose, re-clean contaminated duct sections per shop cleaning requirements and reseal. When a duct system is not being used, all return inlet and supply outlets shall be covered to prevent the migration of dust and dirt from construction activities. If a system is being utilized in a 100% outside air configuration, the return inlets shall be covered. If the system is being used to return or relieve air, the inlets shall be covered by filter media with a minimum MERV rating of 8.

F. Clean external surfaces of foreign substances that might cause corrosion, deterioration of the metal, or where ductwork is to be painted.

G. Prior to equipment start-up, inspect duct to assure it is clean and free of dust, dirt and debris. Demonstrate the cleanliness quality control to the Construction Manager. The duct shall be considered clean when free of visible, non-adhered dust, dirt, debris.

H. If the duct is found to be dirty, the system shall be cleaned in accordance with NADCA (National Air Duct Cleaners Association) standards at the contractor’s expense.

END OF SECTION

SECTION 23 33 13
DAMPERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all dampers for adjusting and modulating airflow. See floor plans, schedules and details for required equipment for all specific situations.

B. Scope of work includes the installation of all motor-operated control dampers, including those that may be furnished by the Temperature Control Contractor.

1.02 QUALITY ASSURANCE

A. Standards: AMCA Standard 500 Certified Performance.

1.03 MANUFACTURERS

A. Ruskin, Greenheck, Louvers and Dampers, Arrow/United, Vent Products, or American Warming and Ventilating.

PART 2 PRODUCTS

2.01 COUNTERBALANCED BACKDRAFT DAMPERS

A. 0.125” aluminum frame, 0.070” extruded aluminum blades with vinyl edge seal, 1/8” x ½” tiebar linkage axle, synthetic bearings, adjustable counter-balance weights, weather-resistant construction. Ruskin CBD6.

2.02 BALANCING DAMPERS

A. Rectangular Balancing Dampers:
   1. 16 gauge galvanized steel frame, 14 gauge equivalent galvanized steel blades, 6 inches wide, 6 inches O.C., neoprene composite seals, 1/2 inch hex. steel axles, extended 1/2 inch O.D. control shaft. Opposed blade operation, concealed linkage, oil impregnated bearings in stainless steel sleeve. Ruskin CD60.

B. Round Balancing Dampers:
   1. Low velocity (up to 1500 fpm and 2” pressure) – Up to 20” diameter shall be 20 gauge galvanized steel frame and blades, with neoprene blade seal. 3/8” square shaft, synthetic bearing, locking quadrant damper with 2” standoff bracket. Ruskin MDRS-25.
   2. High Velocity (Greater than 1500 fpm) – up to 24” diameter shall be 20 gauge galvanized steel frame, blades of 2 layers of 14 gauge steel sandwiching neoprene blade seal, ½” axle with stainless steel sleeve. Ruskin CDRS-25.

C. Manual balancing dampers for rectangular ducts 12 inches and smaller:
   1. Galvanized steel blades, 5 inches wide, 16 gauge. 3/8 inch square control shaft, opposed blade damper operation, concealed linkage, TFE-filled bearings.
   2. Ruskin Type IVD.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all dampers in ductwork and provide access to adjustments as required.

B. Coordinate the selection and installation of all motor-operated control dampers, including those that may be furnished by the Temperature Control Contractor.

3.02 CONTROLS

A. See Section 23 09 23, "Temperature Control" for control requirements.

B. Provide motor-operated dampers as required to execute the provisions described in Section 23 09 93, "Sequences of Operation."

END OF SECTION

SECTION 23 37 13
GRILLES, REGISTERS, AND DIFFUSERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide grilles, registers, and diffusers as indicated on the Drawings.

1.02 QUALITY ASSURANCE

A. Standards: Air Diffusion Council (ADC).

1.03 RATINGS AND CAPACITIES

A. Refer to Drawings for air device construction, CFM, Noise Criteria, throw, pattern, finish, and accessories.

1.04 MANUFACTURERS

A. Titus , Anemostat, Tuttle & Bailey, Krueger, and Price.

1.05 SUBMITTALS

A. Provide noise criteria to meet that shown on the Drawing Schedules.

PART 2 PRODUCTS

2.01 GRILLES, REGISTERS, AND DIFFUSERS

A. General Construction:
   1. Steel or aluminum, factory-fabricated to evenly distribute design CFM throughout the space without causing noticeable drafts.
   2. Provide all diffusers and registers with a volume controller device complete with an accessible operator unless otherwise indicated.
   3. Diffusers shall be round, linear, or square with adjustable air discharge pattern unless otherwise indicated.
   4. Square ceiling diffusers (for variable volume systems) shall have internal Coanda pockets with a 360 degree isovel pattern enabling them to maintain a nonsmudging horizontal pattern at various air volumes with or without a ceiling.
   5. Grilles shall be same construction as registers without volume-control damper.
   6. All diffusers, registers, grilles, and mounting frames shall be furnished with factory finish as scheduled.
   7. Provide concealed fastener mounting on all surface mount registers.

8. Unless noted otherwise, provide a mounting frame for all air devices mounted in a drywall or plaster ceiling, Mounting frame shall be factory-fabricated by the same manufacturer as the air device being mounted, and shall match air device in material of construction, color, and finish. Permanently secure mounting frame in ceiling construction, and install "lay-in" type air device within mounting frame with flexible ductwork to permit future access above ceiling assembly.

2.02 VANDAL RESISTANT GRILLES, REGISTERS, AND DIFFUSERS

A. When vandal resistant grilles, registers and diffusers are specified, the standard grilles, registers, and diffusers called for on the Drawings are to be provided with vandal-proof fasteners.

2.03 EQUALIZING DEFLECTORS

A. Steel bladed assembly, flat black finish.

2.04 COMBINATION VOLUME CONTROLLER/EQUALIZING DEFLECTOR

A. Steel butterfly damper and steel bladed equalizing deflector assembly, flat black finish.

2.05 VOLUME CONTROLLER

A. Steel radial blades with flat black finish for round neck square diffusers.

B. Steel opposed blades with flat black finish for registers and square neck diffusers.

2.06 INTEGRAL EXTRACTORS AND BALANCING DAMPERS

A. Steel frame and parallel diverting blades, angle bracket, pivot bearing assembly, worm gear operator and control shaft.
   1. Anemostat, Tuttle and Bailey or Titus.

2.07 LINEAR DEVICES

A. Heavy gauge extruded aluminum, satin finish, concealed fasteners, removable cores, built-in volume, and pattern controllers, concealed alignment pins.

B. Provide factory-fabricated and factory-insulated steel plenums for all active sections of linear supply diffusers that are 5 feet long or less. Use multiple sections of factory-fabricated and insulated supply plenums for longer active sections.

C. Provide factory-fabricated steel plenums for all active sections of linear return air devices 5 feet long or less.

D. Provide factory-fabricated end caps for all lay-in linear devices and factory-fabricated end border pieces for all surface mount linear devices.

E. Provide factory-fabricated mitered corners sections as required.

F. Provide non-specular flat black steel blank-offs behind all unused portions of linear air devices.

PART 3 EXECUTION

3.01 INSTALLATION

A. Square diffusers supplied by flexible ducts shall be installed with volume damper and equalizing grid in the diffuser neck.

B. Surface mounted registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling.

C. Wall supply registers shall be installed at least 6 inches below the ceiling, unless otherwise indicated.

D. Provide additional support hangers for diffusers, grilles, or registers mounted in lay-in ceiling tiles.

E. Insure airtight seal at all connections.

F. Paint inside portions of all ductwork or plenums that are visible behind registers or grilles, with non-specular flat black enamel.

3.02 LINEAR DIFFUSER PATTERN ADJUSTMENTS

A. Adjust slots in linear diffusers for proper airflow without objectionable drafts.

B. Adjust slots in linear supply diffusers located adjacent to exterior glazing to direct half of air down along window and other half toward interior.

C. Adjust slots in linear supply diffusers not located near windows for horizontal airflow.

D. Adjust slots in corridors for vertical projection.

END OF SECTION

SECTION 23 37 14
LOUVERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish louvers for the following:
   1. Exhaust Air
   2. Outside Air

B. Turn louvers over to General Trades Contractor for installation and caulking.

1.02 QUALITY ASSURANCE

A. Standards: AMCA Standard 500 Certification for Air Performance and Water Penetration.

1.03 SIZES

A. Refer to the Drawings for dimensions, air flow, accessories and other design requirements.

1.04 MANUFACTURERS

A. Greenheck, Ruskin, Airolite Products, Vent Products, All Lite, Arrow United, Louvers & Dampers or American Warming and Ventilating.

PART 2 PRODUCTS

2.01 FIXED DRAINABLE BLADE LOUVERS

A. Extruded aluminum alloy 6063-T52, 0.081 inch thick blades set at angle in 0.081 inch thick jamb frames, 4 inches deep louver, mitered corners, 1/2 inch mesh aluminum birdscreen in aluminum frame, drainable.

B. Finish to be alkyd baked enamel, color as selected by the Architect.

C. Greenheck Type SED-501.

END OF SECTION

SECTION 23 41 05
FILTERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide filters as shown on the Drawings. Refer to Schedules for type, size, efficiency, and other design requirements.

B. Filters shall have a minimum efficiency MERV-A value when evaluated under the guidelines of ASHRAE Standard 52.2, including Appendix J of the same Standard.

1.02 QUALITY ASSURANCE

A. Standards:
   1. ASHRAE 52.2
   2. MIL-STD-282
   3. UL 900

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Camfil or American Air Filter.

2.02 DISPOSABLE RIGID FILTERS – PLEATED PANEL

A. Filter shall be high-efficiency, high lofted supported glass fiber media in enclosing frame. Filter media shall have reinforced backing, welded wire support grid for tapered radial pleats. Media shall be bonded to frame to prevent air bypass.

B. MERV 8A: Filter shall be 4 or 2 inches deep, UL Class 2 and have MERV-A rating of 8A and a 30-35% average dust spot efficiency when tested to ASHRAE Standards. Initial resistance shall be rated at 0.27 inches W.C at 500 FPM face velocity for a 4 inch deep filter and 0.31” for a 2 inch filter.
   1. Camfil 30/30.

C. MERV 9A: Filter shall be 4 or 2 inches deep, UL Class 2 and have MERV-A rating of 9A and a 40-45% average dust spot efficiency when tested to ASHRAE Standards. Initial resistance shall be rated at 0.27 inches W.C at 500 FPM face velocity for a 4 inch deep filter and 0.30” for a 2 inch filter.
   1. Camfil 30/30 Dual 9.

D. MERV 9A: Filter shall be 12 inches deep, UL Class 2 and have MERV-A rating of 9A and a 40-45% average dust spot efficiency when tested to ASHRAE Standards. Initial resistance shall be rated at 0.20 inches W.C at 500 FPM face velocity.
   1. Camfil Farr Riga-Flo XL.

E. MERV 11A, 13A or 14A: Filter shall be 4 inches deep, UL Class 2, box style filters consisting of mini-pleated wet laid fine fiber media. Filter media shall be of one continuous sheet of micro fine wet-laid glass mat filter media formed into uniformly spaced pleats. Pleat separators shall provide uniform media separation to promote uniform airflow throughout the media. The enclosing frame shall be bonded to the entire periphery of the media pack to prevent air bypass.
   1. Camfil Opti-Pac.
   2. Performance of the filter shall comply with the following minimum performance data based on a 24" by 24" by 4" filter tested at 2000 CFM.

MINIMUM FILTER REQUIREMENTS

Efficiency	Initial Resistance (W.C.)	Media Area
MERV 11A	0.33"	113 sq. ft. based upon 24" by 24" by 4 size
MERV 13A	0.44"	113 sq. ft. based upon 24" by 24" by 4 size
MERV 14A	0.60"	113 sq. ft. based upon 24" by 24" by 4 size

F. Filters shall be capable of withstanding 10 inches W.C. without failure of the media pack.

2.03 GRILLE FILTERS

A. For air grilles provided with a filter frame, provide 1 inch deep MERV 8A filters similar to the Camfil 30/30. Filter media shall have reinforced backing, welded wire support grid. See plans for specific sizes.

2.04 DUCT-MOUNTED FILTER HOUSING

A. Provide a duct-mounted filter housing consisting of 16-gauge galvanized steel / aluminum / stainless steel enclosure with standing flanges to facilitate attachment to other HVAC system components. The housing shall be weatherproof and suitable for rooftop/outdoor installation without modification. Multi-filter adaptable extruded aluminum filter mounting track, dual-access doors, two static pressure taps, door and filter gaskets and seals. In-line housing depth shall not exceed 25". Leakage at rated airflow, upstream to downstream of filter and slide mechanism shall not exceed 1% 3.0" w.g.

B. The housing shall incorporate the capability of multiple stages of filtration without modification to the housing. A filter track of extruded aluminum construction shall be an integral component of housing construction. The track shall accommodate, at minimum, 2" or 4" deep prefilter, and a 6" or 12" deep rigid or pocket final filter.

C. The housing shall include three (3) pneumatic fittings to allow the installation of static pressure gauge(s) to evaluate pressure drop across the prefilter, the secondary filter, the final filter, or any combination of the installed filters.

D. Dual access swing-open doors shall include a neoprene gasket to facilitate a door-to-filter seal against all individual stages of filtration. Each door shall be equipped with adjustable and replaceable positive sealing knobs and replaceable door hinges.

E. Camfil GlidePack MultiTrack 25 or AAF SureSeal.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Install filters and holding frame at locations indicated on the Drawings.

B. Level filter assembly and provide service access.

C. Tighten filters and achieve a 50% gasket crush to prevent air bypass.

D. Install filter gauge across each filter bank, one (1) for each pre-filter and one (1) for each final filter.

E. When operating fans during construction, filters are to be in place and replaced when pressure drop reaches 1 inch W.C. more than the initial resistance. Do not operate fans without filters.

F. At the time of occupancy, install new media throughout for each piece of equipment requiring filters. Provide one (1) complete replacement set of filters for each piece of equipment upon completion of the project.

END OF SECTION

SECTION 23 75 13
DEDICATED OUTSIDE AIR SUPPLY UNITS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a completely factory assembled and tested dedicated outdoor air supply air handling unit of the type and arrangement as shown on the Drawings and as described in the Specifications.
B. Unit shall be designed for indoor installation.
C. Unit shall include be heat pump style design with integrated total heat recovery wheel between return/exhaust air stream and outdoor air stream.

1.02 QUALITY ASSURANCE

A. Standards:
1. American Refrigeration Institute (ARI), Air Moving and Control Association (AMCA), and National Fire Protection Association (NEPA).
2. Unit shall be UL, ETL or CTL approved and factory run tested.
3. ARI 1060
4. AMCA 210.
5. UL Standard 1995, safety Standard for Heating and Cooling Equipment.

1.03 RATING AND CAPACITIES

A. These units shall be in accordance with the following specifications and be of the size, type, capacity and components as shown on the schedule and Drawings. The unit manufacturer shall be held responsible for the proper operation and performance of this equipment.

1.04 MANUFACTURERS

A. United CoolAir (York, PA) model: Alpha Aire II; or equivalent by Addison, Daikin, Oxygen 8, Aaon, or Engineered Air.

1.05 WARRANTY

A. Manufacturer shall provide a “parts only” limited warranty for a period of 12 months from the date of equipment start-up or 18 months from date of shipment from the factory, whichever is less.

B. Manufacturer shall provide a “compressor parts only” limited warranty for a period of 60 months from the date of equipment from the factory.

C. Manufacturer’s limited warranty shall be for parts only. Labor is not included.

PART 2 PRODUCTS

2.01 DEDICATED OUTSIDE AIR SUPPLY HANDLING UNITS

A. General Design:
1. System components:
   a. Exhaust Fan with EC motor.
   b. Pre-Filter bank for both the exhaust air intake and fresh air intake
   c. Total Energy Heat Recovery Wheel
   d. Heating/Cooling Direct Expansion Coil
   e. Modulating Hot Gas Reheat Coil
   f. Sub-cooling Coil
   g. Supply Fan Array EC motor
   h. Duct connection/configuration as shown on the Drawings
2. The Manufacturer shall accept total responsibility for the construction and performance of the complete air-handling unit including fans, coils, filters, etc. Unit performance shall be as shown in the schedule. The unit manufacturer shall submit certified test curves for each unit at rated performance of the fan when operating within the air handling cabinet.
3. Submit certified sound data of the units at rated capacity, including inlet and outlet sound components and transmission loss through the casing. Data shall be presented as sound power levels, reference power 10-12 watts for all eight-octave bands. Sound data shall be obtained from tests made in accordance with AMCA Standard 300.
4. Each unit with all its components and accessories shall be operationally tested at the factory and adjusted throughout and certified to be correct and comply with all requirements as specified before shipment.

B. Cabinet Construction
1. Cabinet shall be unpainted, non-weatherized and constructed of scratch resistant heavy duty galvanized G90 steel. Cabinet shall be assembled using zinc plated fasteners. Cabinet shall be shipped split from the manufacturer for field assembly.
2. Unit shall be provided with integral support. Rails shall accommodate the unit being ceiling mounted using hanging rods or slab mounted.
3. Cabinet access panels shall fit into recessed pockets within the cabinet structure and held in place with screws or tool-operated quick-turn fasteners. Recessed areas will be lined with flexible gasket to minimize air leakage. Some access panels shall have inserts to easily facilitate panel removal. Service panels for filter maintenance are hinged for ease of service.
4. Panels shall allow side access to key internal components to facilitate installation, maintenance and servicing of the unit.
5. Outdoor Air Intake and Return Air Filter Boxes shall ship loose for field installation on Supply and Return openings.
6. Cabinet and removable panels shall be lined with 1” fiberglass, thermal/acoustic insulation. Insulation shall not promote or support the growth of fungi or bacteria. Insulation shall include an acrylic polymer coating to help guard against the incursion of dust and dirt into the substrate.
7. Cabinet and removable panels shall be double-wall construction with interior panels consisting of solid galvanized metal liner.

C. Heat Recovery Device: Enthalpy Wheel
1. Energy recovery shall be an integral part of unit from the manufacturer. No field assembly, ducting, or wiring shall be required with the energy recovery option.
2. Energy recovery shall be provided two total enthalpy energy recovery wheels in a "V" configuration to capture waste heat energy from the building exhaust air stream for conditioning of the entering outdoor air stream. The energy recovery component shall incorporate a rotary wheel designed with a segmented energy transfer media. The segments are mounted in a stainless steel wheel, which then rotates within a galvanized metal cassette frame.

D. Refrigerant Circuit
1. Refrigerant circuit shall be provided with high and low-side Schrader access valves, sight glass with integral moisture indicator, filter-drier, maximum operating pressure (MOP) expansion valve with external equalizer line, expansion valve with internal equalizer line, manual reset high and auto-reset low pressure safety switches. A reversing valve shall be provided in each refrigerant circuit to reverse refrigerant flow through the indoor coil and the heat exchanger(s) for the purpose of providing heat to the space. The reversing valve shall be solenoid operated; 4-way with a 4-way pilot valve sized for minimal pressure drop. The maximum operating pressure of the valve will be 650 PSI. Check valves shall be included as part of the thermal expansion valves or individually as needed to control the refrigerant during the cooling or heating cycle.
2. Refrigerant circuit will be factory leak tested, evacuated, and charged with R-454B refrigerant and run tested prior to shipment.
3. Unit shall contain a hot gas reheat coil and a receiver tank for refrigerant management. The hot gas reheat coil shall be constructed of copper tubing mechanically expanded into aluminum fins.
4. Unit shall contain a subcooling cool between the evaporator coil and reheat coil for increased efficiency.
5. Unit shall contain R-454B refrigerant leak detection and mitigation system.

B. Compressor
1. Unit shall contain a subcooling cool between the evaporator coil and reheat coil for increased efficiency.

F. Evaporator Coil Section
1. Evaporator coil shall be made with heavy wall seamless copper tubes mechanically expanded into tempered aluminum fins with drawn self-spacing collars. Coil end sheets shall be hot-dipped galvanized. Coils shall be 6 rows deep for optimum part load and humidity operation. All coils shall be factory leak checked under pressure.
2. Evaporator coil section shall be equipped with a double sloped 304 stainless steel drain pan with 3/4" NPT female connection condensate drain connection located on the side of the cabinet. Drain pan shall extend to the entire length and width of the evaporator coil.

G. Condenser Coil Section

1. Condenser coil shall be made with heavy wall seamless copper tubes mechanically expanded into tempered aluminum fins with drawn self-spacing collars. Coils shall be 6 rows. Coil end sheets shall be hot-dipped galvanized. All coils shall be factory leak checked under pressure.
2. Condenser coil section shall be equipped with a double sloped 304 stainless steel drain pan with 3/4" NPT female connection condensate drain connection located on the side of the cabinet. Drain pan shall extend to the entire length and width of the condenser coil.

H. Fan / Motor Assemblies

1. The unit supply and exhaust fans shall consist of centrifugal backward curve fans with electronically commutated motors (ECM). The motor RPM shall be directly set by the package unit control system. The balancing contractor shall have direct access to set the motor RPM through the unit control system.

2. Section shall include airflow proving detection. Upon loss of fan motor operation, this control shall enunciate.

G. Filter Section:

1. The evaporator and condenser filters shall be factory provided in an external filter box to be field mounted to the unit cabinet.
2. Filters shall be nominal 2" depth pleated, throwaway type panel filters consisting of cotton and synthetic or synthetic only media with galvanized expanded metal backing and moisture resistant enclosing frame. The filter shall be classified for flammability by Underwriters Laboratories, Inc. as Class 2.
3. The filter media shall have an efficiency of MERV 13 for the outdoor air intake and MERV 8 for the return air, based on ASHRAE test standard 52.2.
4. All filter media shall be provided by the Contractor. Refer to Section 23 41 05, "Filters."

H. Electrical

1. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring.
2. Terminal strips and blocks shall be factory installed internal to the control box and be clearly labeled for control wiring connections. External control wires shall enter the cabinet through the rear of the cabinet.
3 Terminal blocks shall be factory provided for a Remote On / Off switch capability. Controls shall be suitably wired and enabled to accept a signal from a field supplied Remote On / Off switch.

4. Terminal blocks shall be factory provided for a Fire / Smoke Detector sensor interface. Controls shall be suitably wired and enabled to accept a signal from a Fire / Smoke Detector.
5. Terminal blocks shall be factory provided for an External Condensate Pump / Float Switch interface. Controls shall be suitably wired and enabled to accept a signal from an External Condensate Pump / Float Switch.
6. The unit shall contain a self-contained microprocessor with BACNet MS/TP or IP/Ethernet communications.
7. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

O. Controls

1. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.
2. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.
3. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.
4. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip
5. The DDC controller shall be fully BACnet-compatible MS/TP (field convertible to BACnet IP/Ethernet) and all scheduling will be implemented through the BAS.
6. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad character format shall be 8 lines x 22 characters with backlit LCD display. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted.
7. The unit controller shall have the following input/outputs:
   a. 10 universal analog inputs
   b. 18 digital inputs
   c. 6 analog outputs
   d. 18 digital outputs
8. The following information will be provided to the BAS via the BACnet interface at a minimum:
   a. Return air temperature.
   b. Discharge air temperature.

c. Outdoor air temperature.
d. Space air temperature.
e. Outdoor enthalpy, high/low.
f. Compressor suction temperature and pressure
g. Compressor head pressure and temperature
h. Expansion valve position
i. Condenser fan speed
j. Inverter compressor speed
k. Dirty filter indication.
l. Drain Pan Overflow.
m. Airflow verification.
n. Cooling status.
p. Unit status.
r. All time schedules.
s. Active alarms with time and date.
t. Previous alarms with time and date.
u. Supply fan and exhaust fan speed.
w. System operating hours.
    1) Fan
    2) Exhaust fan
    3) Cooling
    4) Individual compressor
    5) Heating
    6) Economizer

8 The user interaction with the keypad shall provide the following:
a. Controls mode
    1) Off manual
    2) Auto
    3) Heat/Cool
    4) Dehumidification
b. Occupancy mode
    1) Auto
    2) Occupied
    3) Unoccupied
c. Cooling discharge air temperature (DAT)
d.. Temperature alarm limits
    1) High supply air temperature
    2) Low supply air temperature
    3) High return air temperature
h. Lockout control for compressors.
i. Compressor interstage timers
l. Economizer changeover
    1) Enthalpy
    2) Drybulb temperature
m. Current time and date
o. Occupied/unoccupied time schedule
p. One event schedule
q. Holiday dates and duration
r. Adjustable set points

s. Service mode
   1) Timers normal (all time delays normal)
   2) Timers fast (all time delays 20 sec)

PART 3 EXECUTION

3.01 INSTALLATION

A. Install air handling unit as shown on the Drawings. Make all ductwork and drain piping connections.

B. Extend trapped condensate drain line from drain pan indirect to floor drain in mechanical room with a 2 inch air gap.

C. After units have been operating for forty-eight (48) hours, all bearings shall be checked and tightened on shaft.

D. At final completion, replace all filters with clean, new filters, and turn one complete set of replacement filters over to the Owner.

END OF SECTION

SECTION 23 81 28
VARIABLE REFRIGERANT FLOW AIR CONDITIONERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a variable capacity heat recovery (VRF) system consisting of outdoor units, branch circuit units, heat recovery units, indoor units, BACNet interface, and controls capable of providing simultaneous heating and cooling. System shall be capable of operating in any mode independently of other indoor units or groups. The system shall change mode of operation with no interruption to the system operation.

B. The control system shall consist of a low voltage communication network of unitary controllers. Refer to Section 23 09 93, "Sequence of Operations" for controls integration.

1.02 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electric Code (NEC).

C. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

D. The outdoor units will be factory charged with R-410A.

E. The system must be installed by factory-trained personnel employed by the Contractor. All bidders shall be required to submit training certification proof prior to installation. By submitting a bid, the Contractor acknowledges the installation price is based on the systems installation requirements and with complete knowledge of the HVAC system requirements.

1.03 RATINGS AND CAPACITIES

A. See Drawings for capacity requirements. Conditions for selection are 75 degrees F and 48.8% RH indoor, 92 degrees F outdoor for summer, and 70 degrees F indoor with 0 degrees F outdoor for winter.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.05 MANUFACTURERS

A. Daikin or Mitsubishi

B. The basis of design is Daikin, with Mitsubishi as acceptable manufacturer. All bidders shall furnish the minimum system standards as defined by the basis of design model numbers and model families as scheduled. All cost, including electrical, for all revisions necessary due to providing a manufacturer other than the design base shall be the responsibility of the HVAC contractor.

1.06 WARRANTY

A. Provide a 10 year parts and a 1 year labor warranty on the entire unit commencing at Project Completion. Warranties commencing from the date of shipment or start-up are not sufficient. Labor warranty shall be provided by a factory-trained service professional.

PART 2 PRODUCTS

2.01 HORIZONTAL DUCTED UNITS

A. General: Indoor units shall be horizontal ducted fan coil units, low profile, with back/bottom return connection (convertible) and front discharge, equipped with an electronic expansion device. The unit shall be constructed of a galvanized steel casing. Computerized PID control shall be used to maintain room temperature within 2 degrees F. Included as standard equipment, a condensate drain pan and drain pump kit. The indoor units sound pressure shall range from 35 dB(A) to 43 dB(A) at low speed 5 feet below the return grille.

B. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, three-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through a net mold resistant filter.
5. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 9 13/16 inches of lift. Provide a condensate alarm switch to shut unit down.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit will be separately powered with 208~230 volts, 1 phase, 60 Hertz.
8. The voltage range will be a minimum of ±10% of system voltage.
9. Switch box shall be reached from the side or bottom for ease of service and maintenance.

C. Unit Cabinet:
1. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:
1. The fan shall be direct-drive type fan, statically and dynamically balanced impeller with high efficiency DC motor with three speeds for up to 0.50 inch static pressure.
2. The fan motor shall be thermally protected.

E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin. Contractor shall provide a separate return air filter box and filter if not provided integral to the unit.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a smooth plate fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The refrigerant connections shall be flare connections and the condensate will be 1 1/4 inch outside diameter PVC.
4. A condensate pan shall be located under the coil.
5. A condensate pump with a 9 13/16 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.

G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 Hertz. The acceptable voltage range shall be 187 volts to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

H. Control:
1. The unit shall have controls provided to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to BACNet networks or interfacing with connection to BAS. Consult with manufacturer prior to applying controls.

I. Accessories:
1. Provide condensate pump with safety alarm.

2.02 VERTICAL UP-FLOW DUCTED UNITS (FLOOR MOUNTED)

A. General: Indoor units shall be vertical ducted fan coil units, with bottom or side return and vertical discharge, equipped with an electronic expansion device. The unit shall be constructed of a galvanized steel casing. Computerized PID control shall be used to maintain room temperature within 2 degrees F. Included as standard equipment, a condensate drain pan and drain pump kit. The indoor units sound pressure shall range from 35 dB(A) to 43 dB(A) at low speed 5 feet below the return grille.

B. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, three-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.

2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the unit to the control box and/or outdoor unit.
4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 9 13/16 inches of lift. Provide a condensate alarm switch to shut unit down.
5. The indoor units shall be equipped with a return air thermistor.
6. The indoor unit will be separately powered with 208~230 volts, 1 phase, 60 Hertz.
7. The voltage range will be a minimum of ±10% of system voltage.
8. Switch box shall be reached from the side or bottom for ease of service and maintenance.

C. Unit Cabinet:
1. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:
1. The fan shall be direct-drive type fan, statically and dynamically balanced impeller with high efficiency DC motor with three speeds for up to 0.50 inch static pressure.
2. The fan motor shall be thermally protected.

E. Filter:
1. Contractor shall provide a separate return air filter box and filter if not provided integral to the unit.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a smooth plate fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The refrigerant connections shall be flare connections and the condensate will be 1 1/4 inch outside diameter PVC.
4. A condensate pan shall be located under the coil.
5. A condensate pump with a 9 13/16 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.

G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 Hertz. The acceptable voltage range shall be 187 volts to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

H. Control:
1. The unit shall have controls provided to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to BACNet networks or interfacing with connection to BAS. Consult with manufacturer prior to applying controls.

I. Accessories:
1. Provide condensate pump with safety alarm.

2.03 FOUR-WAY CEILING CASSETTE UNIT

A. General: The indoor unit model shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion device, for installation into the ceiling cavity equipped with an air panel grill. It shall be a four-way air distribution type, impact resistant, and washable decoration panel. The supply air is distributed via motorized louvers that can be horizontally and vertically adjusted from 0 degrees F to 90 degrees F. Computerized PID control shall be used to maintain room temperature. The indoor units sound pressure shall range from 25 dB(A) to 33 dB(A) at low speed measured at 5 feet below the unit.

B. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion device, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, three-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the BC unit.
4. The four-way supply airflow can be field modified to three-way and two-way airflow to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230 volt, 1 phase, 60 Hertz.
9. The voltage range will be ±10% of system voltage.

C. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available.
3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
4. Fresh air intake shall be directly ducted to the space (no fresh air kit is required).
5. A branch duct knockout shall exist for branch ducting supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 Hertz.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a smooth fin, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a two-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate connection will be PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 Hertz. The acceptable voltage range shall be ±10% of system voltage.

H. Control:
1. The unit shall have remote mounted controls provided by the unit manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to BACNet networks or interfacing with connection to BMS.

I. Accessories:
1. Provide remote "in-room" sensor kit.
2. Provide condensate pump.

2.04 WALL MOUNTED UNIT

A. General: Indoor unit shall be a wall mounted fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. This compact design with finished white casing shall be available from 7,500 Btu/h to 24,000 Btu/h capacities. Computerized PID control shall be used to maintain room temperature within 1 degree F. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature. A mildew-proof, polystyrene air filter and condensate drain pan shall be included as standard equipment. Provide a field installed condensate pump, wired to the indoor unit for power. The indoor units sound pressure shall range from 32 dB(A) to 35 dB(A) at low speed measured at 3.3 feet below and from the unit.

B. Performance: Each unit's performance shall be as scheduled, based on the following:
   1. Cooling performance based on indoor conditions of 80 degrees F DB/67 degrees F WB, outdoor conditions of 95 degrees F DB, and 25 foot pipe length. Heating capacity shall be based on indoor conditions of 70 degrees F DB, and outdoor condition of -4 degrees F DB.

C. Indoor Unit:
   1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, three-minute fused time delay, and test run switch. The unit shall have an auto-swing louver that ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.
   2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
   3. Both refrigerant lines shall be insulated from the outdoor unit.
   4. Return air shall be through a resin net mold resistant filter.
   5. The indoor units shall be equipped with a condensate pan.
   6. The indoor units shall be equipped with a return air thermistor.
   7. The indoor unit will be separately powered with 208~230 volt, 1 phase, 60 Hertz.
   8. The voltage range will be ±10% of system voltage.
   9. Vertical refrigeration drops shall be concealed within walls whenever possible or, if that is not possible, then all exposed lines shall be installed within a line set cover system.

D. Unit Cabinet:
   1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
   2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

E. Fan:
   1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
   2. The fan motor shall operate on 208/230 volts, 1 phase, 60 Hertz with a motor output range 0.054 HP to 0.058 HP.
   3. The airflow rate shall be available in high and low settings.
   4. The fan motor shall be thermally protected.

F. Condensation Pump:
   1. Provide condensation pump with safety alarm.

2.05 SUSPENDED CEILING CASSETTE UNIT

A. General: The indoor unit model shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion device, for installation suspended below the ceiling with auto swing horizontal vane. It shall have an impact resistant and washable decoration casing. Computerized PID control shall be used to maintain room temperature. The indoor units sound pressure shall range from 25 dB(A) to 33 dB(A) at low speed measured at 5 feet below the unit.

B. Indoor Unit:
1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion device, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, three-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the BC unit.
4. The indoor units shall be equipped with a condensate pan and condensate pump.
5. The indoor unit will be separately powered with 208~230 volt, 1 phase, 60 Hertz.
6. The voltage range will be ±10% of system voltage.

C. Unit Cabinet:
1. The cabinet shall be space saving and shall be located below the ceiling.
2. Fresh air intake shall be directly ducted to the space (no fresh air kit is required).
3. A branch duct knockout shall be used for branch ducting supply air.
4. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 Hertz.
3. The airflow rate shall be available in four settings.
4. The fan motor shall be thermally protected.

E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a smooth fin, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a two-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate connection will be PVC.
5. A condensate pan shall be located under the coil.

6. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 Hertz. The acceptable voltage range shall be ±10% system voltage.

H. Control:
1. The unit shall have remote mounted controls provided by the unit manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to BACNet networks or interfacing with connection to BMS.

I. Accessories:
1. Provide remote "in-room" sensor kit.
2. Provide condensate pump.

2.06 OUTDOOR UNIT

A. Outdoor Unit: The outdoor unit shall be completely assembled, piped, wired, and tested at the factory. Provide galvanized steel frame that is finished with a powder coat, baked enamel finish. System shall have DC inverter-driven hermetic scroll compressor(s), and the unit shall operate with R-410a. All units requiring a factory supplied twinning kit shall be piped together in the field without the need for equalizing lines. This unit shall have an accumulator, high pressure safety switch, crankcase heater, high efficiency oil separator and over-current protection. The unit shall be capable of operating in the heating mode with ambient temperatures down to -4 degrees F. Provide vertical discharge, variable speed, direct drive fans with permanently lubricated bearings, and a condensing coil that is of non-ferrous construction with louvered fins on copper tubing.

B. The unit sound rating shall be no higher than 60 dBA individually and 64 dBA if twinned. Coil shall be corrugated plate fins on copper tubing. Coils shall have integral metal guard. Unit shall have at least one inverter driven scroll compressor with internal thermal overload.

C. Heat Recovery Units: The heat recovery units are to be constructed of galvanized steel, and they shall contain piping, valves, and controls to divert refrigerant for optimum efficiency. These heat recovery units are to be completely assembled, piped, wired, and run tested at the factory. Provide one double spiral tube-in-tube heat exchanger per port of the heat recovery unit.

D. Control System: Provide a central controller for the system that can control all of the indoor units and the outdoor unit. This controller will initiate the mode change from heating to cooling, and it can lock out the system or individual units. Provide a building network unit interface to communicate between the central controller and the Building Automation System via a BACNet interface. This will allow the system to be accessed through the Web, and it will provide status reports for functions such as operation mode, fan speed, errors, airflow, and set temperature.

2.07 CONTROLS

A. Provide a complete electronic control system interconnecting all components of the system.

B. Control system shall interface with the BAS via BACNet read/write level control of all components. Refer to the Sequence of Operations section for interface requirements between the manufacturer control system and the BAS.

C. Provide access to all data needed for building maintenance. Provide one unit of each tool required for service and start-up. Provide Owner training for each device.

D. Refrigerant leak alarm shall be sent to the BAS.

E. Indoor units shall be controlled by a remote temperature sensor and controller with backlit LCD display. The indoor units shall be daisy-chained to the BC unit, the outdoor unit and then to the central controller. Refer to Section 23 09 93, "Sequences of Operation" for further details on operation and BAS interface.

F. Provide hardware and software necessary to monitor and report system energy use to the BAS.

2.08 BC UNITS

A. The Controller shall include multiple branches to allow simultaneous heating and cooling by allowing wither hot gas refrigerant to flow to the indoor unit for heating or subcooled liquid to flow to indoor units for cooling. Units shall be equipped with a control interface to perform all functions necessary for operation.

B. The casing shall be galvanized steel and shall house liquid-gas separator and multiple control valves and two tubes in tube heat exchangers. Unit shall be complete with drain pan and drain. Linear electronic expansion valves shall control the refrigerant flow.

C. Provide Diamondback (R-410A compatible) refrigerant isolation valves on the branch outlets to the fan coil. Provide appropriate isolation valves on the inlets from the outdoor units.

D. Electrical: Unit shall be 208/230 single phase for power and 24 VDC for controls.

2.09 PIPING

A. Provide hard drawn, Type "L" copper piping (ASTM B88) from the outdoor unit to the branch connector. Fittings shall be wrought copper or bronze with brazed joints.

B. Provide soft copper line sets from the BC to the fan unit.

2.10 DUCTLESS SPLIT SYSTEM

A. Provide single zone, split system unit(s) at locations noted on the Drawings. Unit's controls shall fully interface to the control system for the fan coil/ACCU system throughout the building.

PART 3 EXECUTION

3.01 INSTALLATION TRAINING (FACTORY)

A. Provide factory training for four individuals from Owner. Training shall include installation and controls.

B. Install unit and piping as per manufacturer's written recommendations.

C. Make wiring connections between remote room control and unit mounted control devices and panel. Make any other field wiring connection required for remote or duct mounted sensors.

D. Make all refrigerant-piping connections, fully charge unit, and complete installation in accordance with the manufacturer's written installation instructions.

E. Outdoor unit shall be securely installed on concrete equipment pad on grade.

F. All refrigerant lines between the outdoor unit and the BC and the BC and the indoor units shall be insulated.

G. The system start-up shall be by manufacturer trained and certified personnel.

END OF SECTION

SECTION 23 82 36
FINNED TUBE AND PANEL RADIATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide fin radiation and panel radiators, as shown on Drawings.

B. Include all fillers, panels, extensions, covers and end poles as required for a clean finish. Provide pipe covers to cover horizontal piping from wall to the heating unit, or as shown on the drawings.

C. Include all supports, brackets, internal baffling and trim for panel radiators.

1.02 RATINGS AND CAPACITIES

A. Refer to the Drawings for type, arrangement, MBH, and mounting configurations.

1.03 MANUFACTURERS

A. Electric Fin Radiation: Indeeco, Marley, Trane, Vulcan, or Emerson Chromalox.

PART 2 PRODUCTS

2.01 ELECTRIC FINNED TUBE RADIATION

A. General Construction: 16 gauge steel or 14 gauge enclosure, aluminum top discharge grille, all required controls and thermostats.

B. Electric Heating Element: Heating elements shall be aluminum long-life metal sheath with low sheath temperature and corrosion-resistant finish. Provide integral circuit breaker.

C. Controls: Power lead disconnect switch and thermal overheat protector. Provide unit-mounted thermostat, unless noted otherwise.

D. Finish: Submit available standard color charts for final color selection by Architect.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure units to building structure and level.

END OF SECTION

SECTION 23 82 39
UNIT HEATERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide unit heaters, complete with coil, filters, fans, and controls.

1.02 QUALITY ASSURANCE

A. Standards: Underwriters' Laboratories (UL) label.

1.03 RATINGS AND CAPACITIES

A. Refer to the Drawings for type and arrangements, MBH, CFM, GPM, voltage, HP, and other design requirements.

1.04 MANUFACTURERS

A. Electric Units: Trane, Qmark, Indeeco, Chromalox, Modine, or Berko.

B. Electric Wall Heaters: Trane, Qmark, Broan, Indeeco, or Berko.

PART 2 PRODUCTS

2.01 CABINET UNIT HEATERS

A. General Construction: Galvanized steel wraparound chassis with full back plate and flanged edges for rigidity, complete with filter rails and disposable filters, fan board, control cabinet, insulation backing on cabinet area covering coil section, and tamperproof access doors to controls and unit levelers.

B. Heating Element:
1. Electric Heating: Individual elements shall be mounted in heavy gauge steel frame and be of the tubular finned metal sheath type. Elements shall have a corrosion-resistant finish and be of the low surface temperature type. A circuit breaker shall be furnished.

C. Fans: Forward-curved, double width aluminum centrifugal wheels, shaft-mounted to permanent split capacitor enclosed motor with built-in thermal overload protection, and extended bearing oilers (where applicable).

D. Controls: 24 volt, including control transformer, fan motor starter, fan speed switch unit mounted, and thermostat. Provide unit mounted thermostat for vertical units and wall mounted thermostats for horizontal units, unless noted otherwise.

E. Electrical: Provide a single point power connection with a factory installed disconnect switch.

2.02 PROPELLER UNIT HEATERS

A. General Construction:
1. Horizontal Projection Units: Stamped steel case, phosphatized and finished with baked enamel, complete with full back plate for resilient fan mounting with guard, venturi air inlet, double-deflection adjustable louvers, and weld nuts for hanger rod supports.

B. Heating Element:
1. Electric Heating: Steel finned metal sheath with low sheath temperature and corrosion-resistant finish. Provide circuit breaker, fan delay switch, and thermal overload protection.

C. Fan: Balanced propeller type, aluminum blades, shaft-mounted to totally enclosed motor with thermal overload protection and Class "B" insulation.

D. Controls: 24 volt, including control transformer, fan motor starter, fan speed switch unit mounted, and thermostat.

2.03 ELECTRIC WALL HEATERS

A. General Construction: 16 gauge steel bar grille with aluminum frame and tamperproof access to controls and thermostat.

B. Electric Heating Element: Heating elements shall be steel finned metal sheath with low sheath temperature and corrosion-resistant finish. A circuit breaker shall be furnished.

C. Controls: Fan delay switch, power lead disconnect switch and thermal overheat protector. Provide unit-mounted thermostat.

D. Finish: Baked enamel finish and satin finished frame. Color to be selected by architect.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units as per the Drawings and/or the manufacturer's recommendations. Use flexible connections at inlet and discharge ductwork, if applicable.

B. Mount propeller units at 8 feet minimum height to the bottom of unit unless otherwise noted.

C. Install thermostats. Provide all field-installed control and interlock wiring.

D. Filters shall be installed prior to operating the unit fans.

E. At final completion, replace all filters with clean, new filters, and turn one complete set of replacement filters over to the Owner.

END OF SECTION

SECTION 26 00 00
DIVISION 26 - ELECTRICAL INTRODUCTORY STATEMENT

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. The requirements of Instructions to Bidders, General Conditions, and Division 1 apply to all work herein.

B. In addition to conforming to the documents listed in Paragraph 1.01 A. above, the Work performed by the Division 26 Contractor shall conform to all provisions of Sections 26 00 00 through 26 99 99 as included in this Specification. The Division 26 Contractor is to consider the word "Contractor" when used in these Sections to mean himself/herself.

C. The Division 26 Contractor must read the Specifications of all divisions therein because they will be responsible for Work described in other Sections where reference is made to "Electrical Contractor."

D. All work included under this heading is subject to the Bidding Requirements, General Conditions and Division 1 General Requirements written for this entire Specification, whether attached to this Part or not, and the Contractor is notified to refer thereto as an integral part of the Work.

1.02 APPLICABLE SECTIONS

A. Contractor shall perform Work described in the preceding paragraphs, the General Conditions, Division 1 and in the following Sections (as included):

Electrical: Sections 26 00 00 through 26 99 99

B. Contractor is required to coordinate his/her work with that described in other Sections, and therefore, must familiarize themselves with the entire set of Specifications.

1.03 RESPONSIBILITY

A. The Engineer's efforts under this Contract are aimed at designing a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed must not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

END OF SECTION

SECTION 26 00 05
DIVISION 26 GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish all materials, labor, tools and equipment to complete and leave ready for operation all electrical systems as called for in these Specifications or shown on the Drawings and any and all details essential to complete the work.

B. By submitting a bid, the Contractor certifies that:
1. He/she has visited the site and is satisfied that he/she understands all site conditions that may have an effect on his/her bid price.
2. He/she fully understands the makeup, construction, and operation of all systems and equipment he/she is bidding on, and that he/she has included in his/her price all materials, supplies, accessories, and services necessary to make these systems complete and operational.

1.02 REFERENCE

A. These General Requirements are in addition to the other requirements referenced in Section 26 00 00, "Introductory Division 26 Statement." They are not meant to replace them. In case of conflict, ask the Architect for interpretation.

B. The Contractor is responsible for becoming thoroughly familiar with all Drawings and Specifications prior to bidding so that all conditions of work are clear with regard to electrical requirements of equipment, mounting conditions, etc. Contractor shall study reflected ceiling plans, elevations, and details, etc.

C. The Division 26 Contractor is responsible for all electrical work shown, whether noted by his/her division or not, on all Drawings and Specifications in the entire construction documents package. In case of conflict, Contractor shall include greatest quantity of equipment, extent of work, and expense in his/her bid. If there is any question about scope, the bidder must bring his concerns to the attention of the Owner's representative during bidding.

1.03 STANDARDS OF QUALITY

A. Provide quality work conforming to the best accepted practices and standards of the trade. Further definition of quality is given by reference to various laws, codes, standards, and regulations. Refer also to the publications of NECA (National Electrical Contractors Association).

B. All laws and codes having jurisdiction over this project are deemed to be included in their entirety as a part of these Specifications. Also, any other laws, codes, standards, or regulations referenced herein are deemed to be included in their entirety.

C. If a conflict occurs between the Drawings and the Specifications, immediately call the conflict to the attention of the Architect at least ten (10) days before bids are submitted, so an addendum clarification may be issued. Conflicts not brought to the Architect's attention before bids are due, shall be priced by the Contractor to include the most expensive, highest quality and quantity of the conflicting items in question.

D. Material and equipment installed under this Contract shall be new, undeteriorated, and of a quality not less than the minimum specified. All equipment and conductors shall be certified, listed and labeled by UL. If UL does not certify an associated piece of equipment, then certification by another nationally recognized testing laboratory such as ETL shall be permissible. If equipment or conductors are of a type that no testing lab lists or labels, then a safety evaluation must be performed at the supplier's expense by the inspecting authority or another Federal, State or municipal agency.

E. The latest adopted editions of the following also apply to this work:
1. National Electrical Code, NEC
2. National Fire Protection Association Publications, NFPA
3. State Building Codes
4. City Codes
5. Americans with Disabilities Act (ADA)

1.04 CONTRACT DRAWINGS

A. Drawings are schematic and show approximate locations and the extent of work. Exact locations and extent must be coordinated with other Contractors and verified in the field. Coordination of the final fabrication drawings and final coordination of the installation in the field is the Contractor's responsibility. Contractor is to take the design to the next level of detail knowing exactly what equipment and materials he/she is going to provide and build the project based on that equipment and other approved shop drawings.

B. Significant deviations from Drawings must be approved by the Architect.

C. The Architect reserves the right to make minor changes in location which do not require additional labor or material up to the time of roughing-in without additional cost. No cost shall be added to the Contract for a minor change. The Architect shall determine what is "SIGNIFICANT" and what is a "MINOR" change.

1.05 DEFINITIONS

A. "Provide": To furnish and install.

B. "Concealed": Embedded in or installed behind walls and floors, within partitions, above suspended ceilings, or below grade.

C. "Exposed": Not installed underground or "concealed" as defined above.

D. "Contractor": Means the Division 26 Contractor.

E. "Furnish": To purchase and deliver products to the project site and make ready for installation.

F. "Install": To take furnished products, assemble, erect, secure, connect, and place into operation.

G. "Products": Includes materials, systems and equipment.

H. "Work": The providing of products for entire Contract.

1.06 PERMITS, FEES AND NOTICES

A. Unless otherwise excluded in the Contract Documents, secure and pay for all permits and governmental fees, licenses, and inspections necessary for the proper execution and completion of work.

B. Give notice and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction on the performance of the work.

1.07 EXAMINATION OF SITE

A. Certain existing conditions may affect the manner or sequence of the performance of work. Review existing services and structures prior to bidding the work. Review operating schedules for existing systems and services. Coordinate the scheduling of the work with existing operations.

B. The Contractor is required to visit the site of the proposed project. After the Contract is signed, no allowance will be made for lack of knowledge of the project conditions.

C. Verify and reconcile work required by the Contract Documents with conditions at the site.

1.08 UTILITIES

A. Locate any existing utilities prior to construction. Advise the Architect immediately of major conflicts to permit modification of the Contract Documents.

B. Contractor shall record exact locations of all existing overhead and underground site utilities within the project limits on a site layout plan and submit to Architect for review prior to any excavation. Where existing utilities conflict with new work, proposed modifications shall also be marked and identified on the site layout plan.

C. Record locations of all concealed utilities on the Record Drawings.

D. Coordinate any utility service shutdowns or outages with the Architect and the Owner. Shutdowns shall conform to all utility company requirements. Avoid inconveniencing the Owner and provide temporary service during the curtailment, as required by the Architect or the Owner. Provide ten working days advance notice for any required utility outages.

E. At least ten (10) working days prior to construction in an area which may involve underground utility facilities, the Contractor shall notify the Project Engineer, the registered utility protection service and each underground utility company:
1. Utilities Protection Service
Phone 1-800-362-2764

1.09 ABBREVIATIONS

A. Abbreviations used in these specifications:

ADA	-	Americans with Disabilities Act
ANSI	-	American National Standards Institute
CBM	-	Certified Ballast Manufacturers
EIA	-	Electronic Industries Association
ETL	-	Electrical Testing Laboratories
FCC	-	Federal Communications Commission
ICEA	-	Insulated Cable Engineers Association
IEC	-	International Electro Technical Commission
IES	-	Illuminating Engineering Society
ITL	-	Independent Testing Laboratories
NEC	-	National Electrical Code
NECA	-	National Electrical Contractors Association
NEMA	-	National Electrical Manufacturers Association
NESC	-	National Electrical Safety Code
UL	-	Underwriters Laboratories

PART 2 PRODUCTS

2.01 DESIGN BASE MANUFACTURERS ("STANDARDS")

A. The Contract Documents are based on the requirements and layout of the equipment of the Design Base Manufacturer. Coordination of equipment with the building and with other trades has been made for these specific models and manufacturers of equipment. Where several manufacturers are listed, the first named is the Design Base Manufacturer, unless specifically noted otherwise. Products of the other listed manufacturers which are of comparable performance and quality to the Design Base Manufacturers may be submitted for review and approval per Section 26 00 15, "Submittals." Refer to 26 00 05, "Division 26 General Requirements," Paragraph 2.02, "Approved Equals" for products of manufacturers not listed.

B. Prepare new layouts for all non-Design Base Manufacturers equipment and adjust and coordinate these layouts with equipment dimensions or service requirements which may be different from those of the Design Base Manufacturer. Verify that this equipment will fit and function in the indicated application. Submit these layouts as part of the submittal review.

C. Whenever the Contractor furnishes equipment or material other than the Design Base Manufacturer specified, the Contractor is responsible for the cost and coordination of all modifications required not only for his/her work, but also for the work of all other Trades affected. Where changes to other Trades' work are required, this Contractor must include the additional costs of all such work in his/her bid and ultimately make arrangements with these other Trades for such changes and compensate them accordingly. Where changes to design are required, the Contractor shall submit such changes to the Architect for approval. The Contractor shall investigate potential conflicts such as the following:
   1. Physical dimensions and weights
   2. Code required working clearances

3. Connecting pipe sizes
4. Additional control and interlock wiring
5. Lug size and quantity
6. Increased ratings for conductors, overcurrent protective devices, and motor control equipment
7. Increased ventilation requirements
8. Battery capacity
9. Sound levels of audible devices
10. Increased withstand and interrupting ratings of downstream equipment due to differences in overcurrent protective device characteristics

2.02 APPROVED EQUALS (EQUIVALENT) PRODUCTS

A. Equal (equivalent) components (articles, devices, materials, forms of construction, fixtures, etc.) by manufacturers not listed but meeting the specifications may be submitted to the Architect for consideration and possible inclusion into the bidding documents. Submission must be received no later than ten (10) working days before bid date. If approved, such manufacturers will be listed in an addendum.

B. Submittals must include all of the following:
   1. Cover Letter: Company letterhead; addressed to Architect. Indicate the following:
      a. Project name, project number, and phase or bid package if applicable
      b. Specification Section by number and title
      c. Specified Product
      d. Proposed Product
      e. Deviations, if any, from Specified Product
      f. List of attachments
   2. Product Data: Manufacturer's literature, fully describing proposed product with exact item clearly indicated.
   3. Specifications: Manufacturer's specifications with all modifications noted as required to show compliance with Bidding Documents.
   4. Test Data: Where performance requirements are specified, submit laboratory tests to indicate compliance.

C. Failure to comply with and provide all of the above requirements will result in the submission not being reviewed.

2.03 QUANTITIES

A. Equipment may be referred to either in these Specifications or on the Drawings, as singular or plural; Contractor is responsible for verifying the exact number of items required to complete his/her work.

2.04 OWNER FURNISHED (CONTRACTOR INSTALLED) EQUIPMENT

A. Certain items of equipment may be furnished by the Owner to the Contractor. The Contractor shall take delivery of such items and unload them from the truck at the job site.

B. The Contractor shall protect and store such items as part of this Contract.

C. The Contractor shall install these items in conformance with the requirements of the Specifications and Drawings and the supplier's recommended installation instructions.

2.05 ACCESS DOORS

A. Install junction boxes, remote ballasts, power supplies, etc. in locations where they will be accessible. Where not possible, Division 26 Contractor shall pay General Contractor to install access doors for electrical equipment. Coordinate all access door types and locations with the Architect. Remote ballasts and power supplies shall be located in a ventilated space.

2.06 RECORD (AS-BUILT) DRAWINGS

A. Contractor shall maintain at the job site, one (1) copy of Drawings which shall be used exclusively for recording the location of all installed work; not extraneous information such as field notes. Neatly record all information with red pen.

B. Record deviations in locations of concealed conduit, equipment, lighting, outlets, manholes, etc., dimensioned from a fixed control point, including depth of bury, at each change of direction, at each change of slope and as required for further reference. Minor variations need not be recorded. Addendums, Change Orders, Field Work Orders, Supplemental Instructions and other pertinent changes of record shall be recorded. These changes shall be reviewed monthly for conformance.

C. Record deviations made necessary to incorporate equipment different from the Design Base equipment.

D. At completion of the project, Contractor shall deliver "As-Built" Drawings and Coordination Drawings to the Architect for review and approval with regard to completeness. This submission shall consist of the job site "As-Built" Drawings in electronic format and as PDF files. Following approval, provide a full-plotted set as well as the electronic version and original.

E. Refer to Division 1 for additional requirements.

PART 3 EXECUTION

3.01 PAINTING AND RELATED WORK

A. Finish painting in areas of new construction is the responsibility of the General Trades Contractor and is specified in Division 9.

B. Any other painting, required by Sections in Division 26, is the responsibility of the respective Division 26 Contractor. It shall be done by a qualified tradesman skilled in the craft, and shall meet the requirements of Division 9. Each Contractor is responsible for repainting of finished areas disturbed by his/her own cutting and patching.

C. Factory-finished equipment which has rusted or has been damaged shall be cleaned, spot primed with zinc chromate, and finished to the original quality and color by the Contractor.

D. Support steel shall be cleaned, rust removed, primed, and painted.

3.02 CUTTING AND PATCHING

A. Unless otherwise required in General or Special Conditions, Contractor shall perform all cutting and patching required for his/her own work. Work must be accomplished in a neat and workmanlike manner, acceptable to the Architect.

B. If necessary to cut into work of other Trades, it shall be done by other Trades at this Contractor's expense. Patching shall be similarly executed.

C. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the Architect. Use rotary drills where cutting holes through concrete, brick, plaster, or tile is necessary. Obtain approval of the Architect before proceeding with work.

D. All cutting and patching shall be done promptly and all repairs shall be made as necessary to leave the entire work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, and other materials as specified or required for proper assembly, fabrication, installation, and completion of all work of the Contract.

E. Patching shall match adjacent materials and shall be accomplished only by tradesmen skilled in the respective craft required. Materials and equipment used in the patching work shall comply with requirements of those Sections of the Specifications relating to material to be used in new construction.

3.03 SCAFFOLDING, RIGGING, HOISTS AND TRANSPORTATION

A. The Contractor shall provide scaffolding, staging, cribbing, tackle, hoists, and rigging necessary for placing of his/her materials and equipment in their proper places in the project.

B. The Contractor shall pay costs for transportation of materials and equipment to the jobsite and shall include such costs in his/her proposal.

C. Scaffolding and hoisting equipment shall comply with requirements of applicable Federal, State, and Local Laws and Codes.

3.04 CLEANING

A. Upon completion of work, all material and equipment furnished in this Contract shall be thoroughly cleaned of labels, dirt, grease, rust, oil and other foreign matter. Prepare for finish painting, where painting is specified.

3.05 TESTS

A. The Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction may require portions of the work to be inspected, tested, or approved. These services shall be performed by approved agencies.

B. The Architect (and Owner's representative) must be notified of all scheduled tests and adjustments at least 72 hours before they are scheduled so that he/she may witness same. Obtain confirmation of attendance or absence for each test. If the Contractor performs any test or adjustment without the Architect present, or without proper notification, the Contractor may be required to perform the test or adjustment a second time. All test schedules are to be coordinated with the Owner to minimize inconvenience.

C. The Contractor shall bear all costs of such inspections, tests, or approvals.

D. Required certifications of inspection, testing, or approval shall be secured by the Contractor and included in the Record and Information Manuals. See Section 26 00 20, "Record and Information Manuals."

3.06 WARRANTY OF WORK

A. The Contractor shall warrant all work for a period of one (1) year from date of Contract Completion against defects in materials, equipment, and workmanship. All manufacturer warranties shall begin on date of Contract Completion also.

B. The Contractor will be required to make all repairs or changes which, in the opinion of the Owner, are necessary as the result of defective materials, equipment, or workmanship.

C. The Contractor shall, promptly upon receipt of notice from the Owner, and without expense to the Owner, replace all defective work with suitable materials and equipment.

D. Failure by the Contractor to promptly respond to warranty service calls can be sufficient reason for the Owner to have the defects corrected at the expense of the Contractor.

E. Refer to Division 1 for additional guarantee requirements.

F. Refer to other Specification Sections for extended warranty requirements.

3.07 TEMPORARY POWER

A. Provide temporary electrical power to be used for construction purposes by all Contractors in accordance with Division 1. Provide all fixtures, wiring, and equipment, and make all connections required for temporary electrical service during the construction period; coordinate all power and lighting requirements with the various trades. Provide power to contractor job trailers, and power and lighting on the construction site. Contractor to pay for energy consumption, and any utility company charges to establish service.
   1. Temporary Service Panels: Provide a minimum of one (1) 100 Ampere rated service panel in a location or locations within 200 feet of all building work areas; include as many such panels as required to meet 200 foot maximum distance. Provide all wiring and raceways required for service connection and branch circuit wiring connecting each panel to the serving utility and to the following electrical loads; obtain all permits required.
   2. Lighting: Provide minimum of 5 footcandles of illumination in all building work areas where construction work is being accomplished; increase illumination to 50 footcandles for painting, plastering and other interior fine finish work.

3. Outlets: Provide duplex receptacle outlets on 100 foot centers maximum; arrange and locate so that no work area of the building is more than 100 feet from a 120 volt outlet; allow no more than five (5) outlets on any 20 Ampere circuit.
4. Power Circuit Breaker: Provide one 100 Ampere, 208 volt, 3 phase or 240 volt, 1 phase circuit breaker in each panel for power equipment.

END OF SECTION

SECTION 26 00 10
COORDINATION BETWEEN TRADES

PART 1 GENERAL

1.01 DESCRIPTION

A. The Division 21, 22, 23, 26, 27 and 28 Contractors shall coordinate their rough-in, service, and control requirements with each other. Division 26 Contractor shall review all control Drawings to coordinate exact number and locations of temperature control panels as well as to provide proper starters (including necessary time delays, auxiliary contacts, etc.).

B. Division 26 Contractor shall coordinate all of his/her work with the General Trades Contractor for location of all devices, luminaires and equipment prior to rough-in.

C. All wiring required to power Division 21, 22, 23, 27 and 28 equipment shall be installed by the Division 26 Contractor, including 120 volt to temperature control panels. The Division 26 Contractor shall be responsible for all wiring from the fire alarm control panel.

D. If motors and/or equipment are furnished by other divisions, which require larger or smaller starters, safety switches, circuit breakers, fuses, and/or branch circuit conductors than indicated, the Contractor furnishing the motors or equipment shall reimburse the Division 26 Contractor for any cost differential of providing different sized equipment.

E. All electrical devices furnished as a part of Division 21, 22, 23, 27 and 28 equipment, and installation requirements of all electrical work done by Division 21, 22, 23, 27 and 28 Contractors shall conform to the applicable sections of Division 26.

F. Division 26 Contractor shall coordinate with other Contractors prior to installation of switchboards and panelboards to insure requirements of NEC Article 110 and 408 are met. The Contractor violating this requirement shall be responsible for the cost of all modifications required to comply to the satisfaction of the inspection agency for failure to meet the above code requirements.

G. Final operation of equipment provided under Division 21, 22, 23, 27 and 28 shall be the responsibility of the respective Division 21, 22 or 23 Contractor.

H. Division 26 Contractor shall coordinate in particular with Divisions 8, 10, 11, 12, 13, and 14 Contractors for specific requirements for door hardware, kitchen equipment, elevators, pool, theatrical equipment, window shades, etc.

I. Division 26 Contractor shall provide an appropriate safety switch for all mechanical equipment that he/she is providing power for, unless furnished with equipment.

J. Division 26 Contractor is responsible for all electrical work shown on all documents within the bid set.

END OF SECTION

SECTION 26 00 11
COORDINATION WITH UTILITY COMPANIES

PART 1 GENERAL

1.01 DESCRIPTION

A. The Division 26 Contractor shall coordinate division of responsibility with the utility companies serving the building.

B. The Division 26 Contractor shall provide, furnish, or install materials and labor not provided, furnished or installed by the utility companies.

C. Electrical Utility Company Allowance: The Division 26 Contractor shall include in his/her Bid an allowance of payment to the electric utility company for electrical service and aid to Construction charges. The Division 26 Contractor shall provide actual invoice of charges and shall provide credit to Owner if charges are less than $25,000. If actual invoice is greater, the Division 26 Contractor shall submit a change order for the additional charge over $25,000.

1.02 DIVISION OF WORK - ELECTRIC POWER UTILITY COMPANY

A. The electric power utility company is responsible for the following:
1. Furnishing meter socket box and metering transformers
2. Furnishing and installing service transformer
3. Furnishing and installing primary voltage cables and lugs
4. Furnishing and installing meter and metering wires

B. The Division 26 Contractor is responsible for all other work, including the following:
1. Providing trenching and backfill for primary and secondary service laterals
2. Furnishing and installing conduits for primary and secondary laterals
3. Furnishing and installing secondary voltage cables and lugs
4. Furnishing and installing service transformer pad
5. Furnishing and installing 2-inch rigid conduit for metering and transformer cabinets
6. Installing metering transformers, meter socket box and supports
7. Furnishing and installing ground rods and conductors to meters and transformers

1.03 DIVISION OF WORK – TELEPHONE/DATA UTILITY COMPANY

A. The telephone/data utility company is responsible for the following:
1. Furnishing and installing main service telephone/data cables

B. The Division 26 Contractor is responsible for all other work, including the following:
1. Providing trenching and backfill for telephone/data service lateral
2. Furnishing and installing telephone/data service lateral conduits

1.04 DIVISION OF WORK - CABLE TELEVISION UTILITY COMPANY

A. The cable television utility company is responsible for the following:
1. Furnishing and installing main cable television cables

B. The Division 26 Contractor is responsible for all other work, including the following:
   1. Providing trench and backfill for cable television lateral
   2. Furnishing and installing cable television conduits

PART 2 PRODUCTS

2.01 CONDUIT AND CABLE

A. Refer to Section 26 05 43, "Underground Raceways."

B. Refer to Section 26 05 10, "Wire and Cable."

PART 3 EXECUTION

3.01 INSTALLATION

A. Refer to applicable Division 26 Sections.

END OF SECTION

SECTION 26 00 15
SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

A. Refer to the GENERAL CONDITIONS and Division 1 for general requirements.

B. Materials and equipment installed in this work shall meet all the requirements of the Contract Documents and no materials or equipment shall be ordered until submittals are reviewed and approved by the Architect and Engineer.

C. Submit complete catalog data or shop drawings for each manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, dimensional data, material gauge or thickness, wiring diagrams, brand name, catalog number, and general type.

D. Catalog data for equipment reviewed by the Engineer shall not take precedence over the requirements of the Contract Documents. The review of the Engineer shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Trades.

E. When submitted for review, all shop drawings shall bear the Contractor's signed certification that he/she has reviewed, checked, and approved the shop drawings, that they have been coordinated with the requirements of the project and with the provisions of the Contract Documents, and that he/she has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. Annotations shall be in red ink.

F. Each required Specification Section submittal shall be complete with all required information included in one PDF file. External web links are not permitted. Include a transmittal cover page indicating Specification Section name and number.

G. Each section shall be submitted separately for each section. Combining sections will result in revise and resubmit with no review.

H. Submittals shall be sent to shopdrawings@korda.com.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Complete review of shop drawings, product data, and samples prior to submission.

B. Determine and verify:
1. Field Measurements
2. Field Construction Criteria
3. Catalog Numbers and Similar Data
4. Conformance with Specifications

C. Coordinate each submittal with requirements of the work and the Contract Documents.

D. Include a letter in the front of the submittal of any deviations in the submittals from the requirements of the Contract Documents.

E. Make submittals and resubmittals, if necessary, promptly in accordance with the approved schedule and in such sequence as to cause no delay in the work or in the work of any other Contractor, or the project as a whole.

F. Make any corrections or changes in rejected submittals as required by the Architect and resubmit until approved.

G. Begin no fabrication or work which requires submittals until approved submittals are returned.

1.03 INCORPORATION OF SUBMITTALS INTO RECORD AND INFORMATION MANUALS

A. Refer to Section 26 00 20, "Record and Information Manuals."

1.04 CERTIFICATIONS

A. Provide:
1. Test Agency results verifying capacities, operating conditions and power requirements at design conditions
2. Manufacturer's Statement of Compliance with Standards discussed in individual Specification Sections
3. Equipment labels indicating Certification requirements
4. Quality standard designations on each unit piece
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with
6. Other Certifications listed in other Sections of the Specifications

1.05 REQUIRED SUBMITTAL INFORMATION

A. Submittal Transmittal
1. Provide the following information on the Transmittal Form for each submittal:
   a. Project name and address.
   b. Specification number, as listed for each submittal item required in Paragraph 1.05C below.
   c. Item description, as listed for each submittal item required in Paragraph 1.05C below. Where equipment is identified by number or tag on the documents, same shall be indicated on the submittal.
   d. Specification number and item description (b and c, above) for each submittal if more than one submittal is sent under one transmittal form.
   e. Name, address and telephone number of Contractor.
   f. Bid package number (if applicable).
2. Submittal Transmittal Forms not properly identified with the above information will be returned (without review) to the Contractor.

B. Refer to the following letter key:

KEY FOR REQUIRED SUBMITTALS:

A. Shop Drawings and/or Layout Drawings
B. Product Data Sheets
C. Color Samples
D. Product Samples
E. Typed Statement
F. Typed Verification of Compliance with Certification Requirements
G. Motor Efficiencies and Power Factor
H. Wiring Diagrams
I. Installation, Operation, and Maintenance Instructions
J. Reports or Test results

C. Submit information on equipment items as listed below.

SECTION #	CONTRACT ITEM	SUBMITTALS REQUIRED
26 00 20	RECORD AND INFORMATION MANUALS	A, B, E, F, H, I
26 00 75	ACCESS PANELS	B
26 08 40	ELECTRICAL TESTS, ADJUSTMENTS, INSPECTIONS	J
26 09 26	LOW VOLTAGE CONTROL SYSTEM	A, B, H, I
26 24 20	PANELBOARDS	B, I
26 24 22	DISTRIBUTION PANELBOARDS-CIRCUIT BREAKER TYPE	B
26 27 26	WIRING DEVICES AND PLATES	B
26 28 13	FUSES	B
26 28 16	SAFETY SWITCHES	B, I
26 28 17	ELEVATOR SAFETY SWITCHES	B, H
26 28 19	CIRCUIT BREAKERS	B, I
26 29 13	MOTOR CONTROLLERS	B, H, I
26 41 13	LIGHTNING PROTECTION SYSTEM	A, B, H, I
26 43 13	TRANSIENT VOLTAGE SURGE SUPPRESSION	B, I
26 51 14	LUMINAIRES	B
26 81 11	FIRE ALARM SYSTEM	A, B, H, I
26 81 15	EMERGENCY RESPONDER RADIO ANTENNA REPEATER SYSTEM	A, B, H, J
26 81 18	RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA REPEATER SYSTEM	A, J

D. After approval, one (1) copy shall be returned to the Contractor. Contractor shall make prints of the approved transparencies and reproductions of all other shop drawing information as necessary for his/her use and for inclusion in the Record and Information Manuals.

END OF SECTION

SECTION 26 00 20
RECORD AND INFORMATION MANUALS

PART 1 GENERAL

1.01 RECORD DRAWINGS

A. Refer to Division 1 for general requirements as well as for specific information regarding Record (As-Built) Drawings. All drawings shall be provided in electronic PDF format.

1.02 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 for general requirements and for specific information regarding Operation and Maintenance Manuals, including required format(s) (paper and/or electronic) and quantity. If no such requirements are listed in Division 1, provide in electronic format. Submit one (1) copy of draft manual to the Architect for review and approval thirty (30) days before final inspection is due. After approval, submit three (3) approved manuals to the Owner and obtain receipt. (See Section 26 00 99, "Requirements for Contract Completion.")

B. Paper Copy Manuals shall be loose leaf, three-ring, heavy-duty hard-cover binders. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.

C. Electronic Copy Manuals shall be PDF file format. Individual documents shall have filenames corresponding to specification sections and system names. Each document shall have bookmarks corresponding to the systems, subsystems, and equipment names. Use electronic files prepared by manufacturers where available.

D. The following items, together with any other necessary pertinent data, shall be included in each Manual:
   1. Each manual shall be labeled on front cover with project name, Contract, Contractor's name, Architect, Engineer, and date of project completion.
   2. Manufacturers' names, nearest Factory Representative, and model and serial numbers of components of systems
   3. Operating instructions, start-up and shutdown procedures
   4. Maintenance instructions
   5. Routine and 24 hour emergency service/repair information:
      a. Name, address, and telephone number of servicing agency
      b. Names of personnel to be contacted for service arrangements
   6. Parts list with numbers of replaceable items, including sources of supply
   7. Manufacturers' literature describing each piece of equipment
   8. One (1) approved copy of each submittal
   9. Written warranties
   10. Certificate of Material Receipt and Certificate of System Completion

11. One (1) typewritten directory for each panelboard as installed
12. Record (As-Built) Drawings
13. Certificate of Final Inspection signed by Building Authority Having Jurisdiction
14. Test results
15. Video recordings of all equipment demonstrations and training sessions

END OF SECTION

SECTION 26 00 25
EXCAVATION, BACKFILL, AND PROTECTION OF UTILITIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all protection, removal, and relocation of existing utilities and all excavation and backfilling (including concrete), associated with the work of this Division.

B. Locate all existing utilities and equipment, in all areas of work, and record the actual locations. Take extreme care during excavations to avoid interruption of utilities. Relocate new work, as directed by the Architect or Engineer, if required to coordinate new work with existing conditions. If incorrectly charted or uncharted utilities are encountered, notify the Architect immediately.

C. Disconnect all utilities designated for removal or relocation.

D. Cooperate with other Contractors and Utility Companies to protect existing utilities and avoid disruption of service. Repair damaged utilities to the satisfaction of the Architect and the Utility Companies.

E. Restore or repair to its existing condition all lawns, planting areas, curbs, paving, streets, and walks damaged by the work of this Division.

F. Coordinate the timing of excavation and backfilling with the work of other Contractors and the requirements of the Architect.

G. In general, conform to the requirements of Division 2, except as specifically modified in this Section.

H. Refer to boring tests and other subsurface records for rock strata that will be encountered in excavation and include sufficient costs in bid for their removal.

1.02 EXCAVATION SAFETY

A. It is solely the Contractor's responsibility to comply with all governing codes and ordinances regarding safety of open excavations. This includes the use of all sheet piling, bracing, shoring, sheathing, warning lights, barricades, etc. that may be required. Such material will remain the Contractor's property upon completion of the work.

1.03 SUBMITTALS

A. For Review:
   1. Site layout plan sheet with recorded location of all existing utilities and equipment. Submit for review prior to starting any excavation work.

PART 2 PRODUCTS

2.01 BACKFILL

A. Type A Materials:
   1. Crushed Stone: 3/8 inch size
   2. Pea Gravel: 1/4 inch minimum, 5/8 inch maximum
   3. Sand: Clean, dry, coarse, or medium size
   4. Washed Gravel: 3/4 inch normal size

B. Type B Materials: (Backfill may not contain large rocks (over 2 inches), building materials, masonry debris, cinders, rubbish, wood, or other material subject to decay or prone to damage buried portions of the work.)
   1. Excavated Material (or other clean soil): As permitted in Division 2.

2.02 UNDERGROUND WARNING TAPE

A. Tape shall be a 6 inch wide polyethylene material which resists acid, alkalis, and other soil substances. Black printing shall identify buried service. Background color shall be as recommended by the American Public Works Association (APWA). Brady or equal.

PART 3 EXECUTION

3.01 EXCAVATION

A. Excavate as shown on the Drawings removing all material encountered.

B. Excavations are to be open cuts from the surface. Undercuts are prohibited, except where specifically permitted by the Architect. Hold trench width to a minimum, with banks as nearly vertical as possible.

C. Maintain 5 feet clear between trench and parallel building footing, unless specifically approved by the Architect. When parallel trenches are required to be deeper than footing, maintain a clear distance at least 1 1/2 times the vertical distance below the bottom of the footing, or 5 feet, whichever is greater.

D. Where bedding or concrete encasement is required by Section 26 05 43, "Underground Raceways," extend mechanical excavation as required to accommodate bed.

E. Where bedding or concrete encasement is not required, extend mechanical excavation only to within 4 inches of bottom of trench depth, and excavate remainder by hand, so that final support is by undisturbed soil. Shoring from bottom of excavated trench is prohibited.

F. Keep excavation free of standing water by drainage or by pumping where necessary.

G. Keep excavations free of frost by covering or heating or both.

3.02 BACKFILL

A. Backfill shall be as follows:
   1. For excavations through lawn areas: Type B.
   2. For excavations through roadways, parking areas, sidewalks, plazas, etc.: Type A.

B. Where unstable or wet soil in trench bottom requires over excavation to firm soil, and in areas of accidental undercutting, backfill to planned bottom elevation with crushed stone, tamped firmly in place.

C. Backfill only when exact locations of lines and equipment have been recorded and all tests and inspections have been completed.

D. Do not use fill in a frozen condition or place fill on frozen ground.

E. Install a continuous warning tape with printing identifying buried service, 12 inches below finished grade, during backfilling operation.

F. Refer to Section 26 05 43, "Underground Raceways" for concrete encasement requirements. Do not backfill above concrete until concrete has had sufficient setting time (one day minimum).

G. Remainder of backfill shall be per the requirements of Division 2.

H. Install backfill in 8 inch lifts and compact to 98%.

I. Fill any settled areas at completion of project.

3.03 SPOILS

A. Stockpile excavated material onsite in accordance with Owner's direction. Remove from site prior to project completion.

END OF SECTION

SECTION 26 00 30
CONCRETE FOUNDATIONS, SUPPORTS, AND ENVELOPES

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide all concrete work needed for this Division as shown on the Drawings and herein specified. All concrete work incidental to the work of Division 26 is the responsibility of the Division 26 Contractor. Conform to the quality standards in Division 3. Such concrete includes, but is not limited to:
   1. Encasement of underground raceways, as specified in Section 26 05 43, "Underground Raceways."
   2. Lighting fixture foundations.
   3. Service transformer pad.
   4. Primary switch concrete pad.
   5. Concrete collars around conduit and busway penetration.
   6. Emergency generator concrete pad.
   7. Electrical equipment housekeeping pads.

1.02 QUALITY ASSURANCE

A. Refer to Section 03 30 00, "Cast-in-Place Concrete."

1.03 SUBMITTALS

A. For Review:
   1. Concrete compression testing reports

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

PART 2 PRODUCTS

2.01 CONCRETE

A. Refer to Section 03 30 00, "Cast-in-Place Concrete."

PART 3 EXECUTION

3.01 APPLICATION

A. Provide concrete pads of sufficient size and thickness in accordance with manufacturer of equipment. Details shown on the Drawings shall be considered a minimum requirement.

B. Coordinate concrete pad requirements with provider of equipment.

C. Provide minimum 2 inch concrete collar (framed using 2 inches x 4 inches nominal lumber) around all conduit and sleeve penetrations through floors.

3.02 INSTALLATION

A. Refer to Section 03 30 00, "Cast-in-Place Concrete."

B. Provide concrete compression testing for luminaire pole foundations and exterior equipment pads.

C. Do not mount equipment on concrete supports until concrete has had sufficient setting time (seven days minimum).

END OF SECTION

SECTION 26 00 55
SLEEVES, SEALS, AND FIRESTOPS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install sleeves for conduit penetrations through masonry and concrete construction or where conduit passes through walls exposed and through smoke or fire rated separations.

B. Provide watertight, corrosive service, oil resistant service and fire rated seals and firestopping as specified herein.

1.02 QUALITY ASSURANCE

A. Firestopping materials shall be classified by UL as "fill, void or cavity materials" and "through penetration firestop systems."

B. Firestopping materials shall conform to both Flame (F) and Temperature (T) ratings as tested by nationally accepted test agencies per ASTM E-814 or UL 1479 Fire Tests of Through-Penetration Firestops.
   1. The F rating shall be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated.
   2. Conduct the fire test with a minimum positive pressure differential of 0.01 inches of water column.

C. Firestopping equipment used shall be in accordance with the Manufacturer's written installation instructions.

D. Firestopping materials shall be expanded to fill cavities or provide adhesion to substrates that will maintain seal under normal expected movements of substrates.

1.03 SUBMITTALS

A. For Review:
   1. Manufacturer's product data sheets indicating product characteristics, performance and limiting criteria
   2. Manufacturer's installation instruction for each type of seal or firestop required by the project
   3. Written certification that firestopping systems meet firestopping requirements specified herein

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Seals
   1. Link-Seal by Thunderline Corporation
   2. CSD Sealing Systems
   3. O-Z/Gedney Inc.

B. Firestopping Materials
   1. Hilti
   2. Tremco Sealants & Coatings
   3. 3M Fire Protection Products
   4. Dow Corning
   5. CSD Sealing Systems

PART 2 PRODUCTS

2.01 SLEEVES

A. Sleeve material through floors and walls shall be machine cut rigid galvanized steel conduit.

B. Sleeves installed in new construction shall have welded flange at mid-point of sleeve which functions as a water barrier and anchor collar.

C. At the Contractor's option, steel wall sleeves by Link-Seal may be provided.

2.02 SEALS

A. Modular Mechanical Type
   1. Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between conduit and sleeve.
   2. Seal assembly shall have steel bolts and nuts and rubber sealing element for service and environment under which assembly will be used. Seal shall have a pressure resistance rating of 20 psig.

B. Sealing Plug Type
   1. Seals shall consist of two (2) identical piece plugs made of synthetic rubber with one edge flanged, serrated profile on the outside and a series of ridges on the inside which compress and assures a tight seal. Seal shall have a pressure resistance of 15 psig at the plug base and 30 psig at the flange. Rubber grade shall be suitable for the service and environment under which sealing plug will be used.

2.03 WATERTIGHT SEALS

A. Modular mechanical type watertight seals shall have zinc galvanized bolts and nuts with EPDM rubber sealing element. Seals shall be Link-Seal, Type C.

B. Sealing plug type watertight seals shall be made of EPDM rubber. Seals shall be by CSD Sealing Systems.

2.04 FIRE RATED SEALS

A. Modular mechanical type fire rated seals shall have zinc galvanized bolts and nuts with silicone rubber sealing element which provides a three hour fire resistance rating.

B. Sealing plug type fire rated seals shall be made of FRR rubber for three hour fire resistance rating.

2.05 FIRESTOP MATERIALS

A. Use only firestop products that have been UL and ASTM tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in-place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems), or electrical cable bundles, penetrating concrete floors.

C. Sealants, foams or caulking materials for use with non-combustible items including rigid steel conduit and electrical metallic tubing (EMT).

D. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including PVC jacketed, flexible cable or cable bundles and plastic pipe.

E. Foams, intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles.

F. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles.

G. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes.

H. Non curing, re-penetrable materials shall be used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways and raceways.

I. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

2.06 OIL RESISTANT SERVICE SEALS

A. Modular mechanical type oil resistant service seals shall have zinc galvanized bolts and nuts with Nitrile rubber sealing element. Seals shall be Link-Seal, Type O.

B. Sealing plug type oil resistant seals shall be made of Nitrile rubber. Seals shall be by CSD Sealing Systems.

2.07 CORROSIVE SERVICE SEALS

A. Modular mechanical type corrosive service seals have stainless steel bolts and nuts with rubber sealing element having high resistance to most organic compounds, acids, alkalis and related chemicals. Seals shall be Link-Seal, Type S.

B. Sealing plug type corrosive service seals shall be made by Viton rubber. Seals shall be by CSD Sealing Systems.

PART 3 EXECUTION

3.01 APPLICATION

A. Provide sleeves for all conduit penetrations through walls, and through floors where above ground level. Sleeves are not necessary for slab-on-grade penetrations. (Refer to 26 00 30, Concrete Foundations, Supports, and Envelopes, for concrete collar requirements.)

B. Provide one (1) spare sleeve of equal size in any floor or wall area where more than three (3) conduits penetrate floor or wall.

3.02 INSTALLATION

A. Sleeves
1. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and masonry installation.
2. Give the General Trades Contractor locations and sizes of all openings required for the installation of sleeves before construction of masonry or concrete walls is started. If it becomes necessary to cut into new work because of the failure of this Contractor to notify the General Trades Contractor, then the General Trades Contractor shall do any necessary cutting and patching required at this Contractor's expense.
3. Cut sleeves through walls flush with each surface. Unused sleeves shall extend beyond wall surface and be provided with caps.
4. Cut sleeves 3 1/2 inches above finished floors. Joint between sleeve and floor shall be caulked to be watertight. Bottom of sleeve to be cut flush.
5. Core drill holes for sleeves in existing construction.
6. Patching shall be by the General Trades Contractor at this Contractor's expense.

B. Seals and Firestops
1. Clean surfaces and substrates of dirt, oil, loose materials and other foreign materials which may affect the proper bond or installation of seals and firestops.
2. Do not apply seals and firestops to surfaces previously painted or treated with a sealer curing compound or similar product. Remove coatings as required in compliance with Manufacturer's instructions. Provide primers, as required, which conform to Manufacturer's recommendations for various substrates and conditions.
3. Follow Manufacturer's written instructions for installation of seals and firestops.
4. Install firestops with sufficient pressure to fill seal holes, voids and openings to ensure an effective smoke seal and to maintain the fire resistance rating of the assembly.
5. Tool or trowel exposed surfaces. Remove excess firestop material promptly as work progresses and upon completion.

6. Unused sleeves shall be filled with and surrounded by firestop material. Sleeve ends shall be capped. Blind sealing plugs may be used at Contractor's option.
7. Install watertight seals for all below grade penetrations of conduit into the building.
8. Install fire rated seals in all fire rated walls and floors.
9. Install oil resistant service seals in environment where oils, fuels, solvents and other petroleum-base products are used.
10. Install corrosive service seals in environments where organic materials, acids, alkalis and related chemicals are used.

3.03 INSPECTION

A. Examine seals and firestops to ensure proper installation and full compliance with this Specification. Work shall be accessible until inspection and approval by the applicable code authorities.

B. Correct unacceptable seals and firestops and provide additional inspection to verify compliance with this specification at no additional cost.

END OF SECTION

SECTION 26 00 75
ACCESS PANELS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish ceiling and wall access panels as necessary for access to pull boxes, junction boxes, electrical equipment, etc. requiring service, adjustment or maintenance.

B. Access panel size and finish shall be coordinated with architect or owner’s representative before purchasing.

1.02 WORK NOT INCLUDED

A. Access panels are to be turned over to the General Trades Contractor for installation.

1.03 COORDINATION

A. This Contractor is responsible for providing the dimension and locations of all ceiling, wall, and floor openings for the access panels to the General Trades Contractor.

B. Coordinate with other Contractors with respect to access panel locations, and group junction boxes, etc., in such a way as to be accessible from a single panel in a given area.

1.04 MANUFACTURERS

A. Acceptable manufacturers include: Milcor, Bilco, Zurn, Larsen's, Acudor, JL, Inland Ryerson, Nystrom, Mitco or Karp.

PART 2 PRODUCTS

2.01 CEILING ACCESS PANELS

A. Drywall Ceilings: 24" x 24", Milcor Style DW, 16 gauge steel frame with 14 gauge door panel, double acting concealed spring hinges, cylinder lock, prime painted for finish painting with ceiling.

B. Fire Rated Ceiling: 24" x 24", Milcor fire rated access door, UL approved, 16 gauge steel frame with 18 gauge recessed door panel, 20 gauge panel sides and 26 gauge panel hat channel, continuous hinge, self-latching cylinder lock, prime painted for finish painting.

C. Plaster Ceilings: 24" x 24", Milcor Style AP with finish material same as ceiling material or Style K, 16 gauge galvanized steel frame with 18 gauge galvanized steel door panel. 24" x 24" and larger panels shall be reinforced, continuous hinge, cylinder lock, prime painting for finish painting to match ceiling.

D. Acoustical Concealed Spline Ceilings: 24" x 24", Milcor Style AT, 16 gauge steel frame with an 18 gauge steel recessed door panel. 24" x 24" and larger panels shall be reinforced, continuous hinge, cylinder lock, prime painted for finish painting.

2.02 WALL ACCESS PANELS

A. Drywall: 24" x 24", Milcor Style DW, 16 gauge steel frame with 14 gauge door panel, double acting concealed spring hinges, cylinder lock, prime painted for finish painting with wall.

B. Masonry and Tile: 24" x 24", Milcor Style M Standard, 14 gauge steel frame and door panel, concealed spring hinges, cylinder lock, prime painted for finish painting with wall or Style M stainless.

C. Fire Rated: 24" x 24", Milcor fire rated access door, UL approved, 1 1/2 hour, Class B rating, 16 gauge steel frame, 20 gauge insulated door panel continuous hinge, automatic door closer, cylinder lock, interior release mechanism, prime painted for finish painting with wall.

D. Plaster: 24" x 24", Milcor Style K, 16 gauge steel frame with 14 gauge door panel and 22 gauge galvanized casing beads, concealed spring hinges, cylinder lock, prime painted for finish painting with wall.

PART 3 EXECUTION

3.01 COORDINATION OF INSTALLATION

A. Coordinate size, location and installation of panels required to permit convenient access to electrical equipment requiring adjustment, service or maintenance. Mark locations of access panels on Record Drawings.

END OF SECTION

SECTION 26 00 99
REQUIREMENTS FOR CONTRACT COMPLETION

PART 1 GENERAL

1.01 DESCRIPTION

A. The following material must be submitted prior to Contract Completion:
   1. Spare parts
   2. Record and Information Manuals
   3. Accessories and miscellaneous equipment
   4. Keys for equipment

B. Contractor shall use only the attached forms for Material Receipt and System Completion.

1.02 SUBMITTALS

A. To be included in Record and Information Manuals:
   1. Certificate of Material Receipt for all required spare parts
   2. Certificate of System Completion for each system when required by individual Division 26 Specifications

PART 2 PRODUCTS

2.01 SPARE PARTS

A. Furnish spare parts and devices as required by Division 26 Specifications.

PART 3 EXECUTION

3.01 SPARE PARTS AND KEYS

A. Deliver spare parts and keys to Owner's Representative. Obtain a signed copy of the Certificate of Material Receipt (ATTACHED TO THE END OF THIS SPECIFICATION SECTION).

3.02 MANUFACTURER'S INSPECTION

A. Arrange for inspection and approval by Equipment Manufacturer where required by Division 26 Specifications. Provide Manufacturer Representative's signature on the Certificate of System Completion (ATTACHED TO THE END OF THIS SPECIFICATION SECTION).

3.03 OPERATIONAL TEST

A. At completion, Contractor shall operate the systems for a period of at least seven (7) days, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed. Contractor shall sign the Certificate of System Completion (ATTACHED TO THE END OF THIS SECTION).

3.04 EQUIPMENT DEMONSTRATION

A. After all system operational tests have been completed, schedule an instruction period with the Owner. Instruct designated personnel in the operation and maintenance of all systems and equipment. Use manuals to familiarize Owner with equipment and procedures. Allow time as necessary for this instruction. Schedule a time convenient for the Owner and the Architect. All training sessions shall be videotaped for the Owners use in instructing future employees.

Instruction shall include:
1. Location of all components of the system and explanation of their function
2. Programming procedures for computer-based equipment
3. Maintenance and repair procedures
4. Review of documents in Record and Information Manuals

At the completion of instruction, have all attendees sign the Certificate of System Completion.

END OF SECTION

BICENTENNIAL BARN - MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

CERTIFICATE OF MATERIAL RECEIPT

PROJECT NAME: _____

DATE: _____

CONTRACTOR: _____

CONTRACTOR'S REPRESENTATIVE: _____

On the above listed date, the following pieces of equipment, as required by Division 26 Specifications, were delivered to the Owner's Representative:

Equipment	Quantity
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

(Attach a separate page for additional items)

Owner's Representative: _____ (PRINT)

_____ (SIGN)

CERTIFICATE OF SYSTEM COMPLETION

PROJECT NAME: _____

CONTRACTOR: _____

SYSTEM: _____

SPECIFICATION SECTION NUMBER: _____

A. MANUFACTURER'S INSPECTION AND APPROVAL (If required by Specification Section)

The above listed system has been inspected and approved as meeting the Manufacturer's written instructions for installation and operation.

Manufacturer's Representative: _____ Date: _____

B. TESTING

The above listed system has passed all testing required by Division 26 Specifications and has met the terms of the Contract. Written test results are attached.

Contractor's Representative: _____ Date:_____

C. EQUIPMENT DEMONSTRATION

The above listed system has been demonstrated to the following Owner's Representatives:

NAME	TITLE	DATE	SIGNATURE
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

(ATTACH A SEPARATE PAGE FOR ADDITIONAL NAMES)

SECTION 26 05 10
WIRE AND CABLE

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install all electrical conductors for service entrance, feeder and branch circuit wiring and control wiring.

B. Refer to other Division 26 Specification Sections for additional wiring requirements.

1.02 QUALITY ASSURANCE

A. Wire and cable furnished shall be in accordance with the following standards where applicable:
   1. UL Standard 44 for rubber insulated wires and cables
   2. UL Standard 83 for thermoplastic insulated wires and cables
   3. UL Standard 1569 for Type MC cable
   4. UL Standard 817 for flexible cords and cables
   5. NEMA WC 70 / ICEA S-95-658

B. Wire and cable shall be in accordance with applicable NEC Articles.

C. Wire and cable shall be identified by surface markings indicating manufacturer, size, metal type, voltage rating, UL listing and cable type.

1.03 SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

C. Field quality-control reports.

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Conductors
   1. Cerrowire LLC
   2. Encore Wire Corporation
   3. General Cable, Prysmian Group
   4. The Okonite Company
   5. Service Wire Company
   6. Southwire Company

B. Connectors and Splices
   1. Burndy, Hubbell
   2. Ideal Industries, Inc.
   3. ILSCO

C. Metal-Clad Cable, Type MC
   1. AFC Cable Systems, Atkore International
   2. Encore Wire Corporation
   3. Northern Cables
   4. The Okonite Company
   5. Omni Cable
   6. Southwire Company
   7. RSCC VITALink Marmon Wire and Cable
   8. Draka Lifeline, Prysmian Group

PART 2 PRODUCTS

2.01 TYPE "THHN/THWN-2" WIRING

A. Wire shall be single conductor annealed uncoated copper with PVC insulation and nylon jacket. Insulation shall be heat and moisture resistant with light stabilized jacket. Wire shall be rated 600 volt, 90 degree C in dry locations, 75 degree C in wet locations.

B. Conductors No. 10 AWG and smaller may be solid; No. 8 AWG and larger shall be stranded. Where stranded conductors of sizes 12 and 10 are used, appropriate crimp terminations shall be provided on the ends of each conductor for making connections to wiring devices, switches, etc.

2.02 TYPE "XHHW-2" WIRING

A. Wire shall be single conductor annealed uncoated copper with heat and moisture resistant thermosetting cross-linked polyethylene insulation. Wire shall be rated 600 volt, 90 degree C in dry locations, 75 degree C in wet locations.

B. Wire shall be single conductor, uncoated aluminum with XLPE insulation and compressed compacted stranded conductor. Aluminum shall be General Cable Stabiloy AA-8030 alloy, or equal by Southwire.

2.03 TYPE "SOW-A" CORD

A. Cord shall be extra hard usage duty with flexible stranded copper conductors with 90 degree C EP rubber insulation enclosed by a 90 degree C thermosetting jacket that is resistant to oil, ozone, abrasion, and high temperature. Cord shall have a 600 volt rating.

2.04 TYPE "MC" METAL-CLAD CABLE

A. Three (3) conductor (thermosetting cross-linked polyethylene) insulated, aluminum or galvanized steel interlocked armor Type MC power cable for use in circuits not exceeding 600 volts phase to phase at conductor temperatures of 90 degrees C in wet or dry locations for normal operation, 130 degrees C for emergency overload conditions and 250 degrees C for short circuit conditions. Cable is intended for installation indoors or outdoors, aerially, in metal rack, trough or cable trays, or for direct burial.

B. Cable assembly shall include full-size grounding conductor, and full-size isolated grounding conductor (if applicable), with suitable fillers and binder tape.

C. Type "MC" cable shall be of the single circuit type only.

D. Fire resistive cable assemblies shall comply with UL2196.

2.05 CONNECTORS AND SPLICES DESCRIPTION

A. Factory-fabricated connectors splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated.

B. Splices in No. 10 AWG and smaller wire shall be made with insulated connectors with metallic coil springs and contoured wings such as 3M "Scotchlok," Ideal Company "Wing Nut," Thomas & Betts Company "Piggy" connectors, or with mechanically-crimped sleeves as manufactured by T & B or Ideal Company, which shall be insulated with pressure sensitive vinyl plastic electrical tape equal to Scotch No. "33" or No. "88." Push wire or inline connectors are not acceptable.

C. All taps, terminations or splices, size No. 8 and larger shall be made with bolted-type pressure or compression connectors. Connectors shall be compatible with the conductor material. Insulate connectors with electrical tape to 150% of the insulating value of the conductor insulation. The tape shall have insulating properties equivalent to the conductor.

D. All splices located in manholes, handholes and exterior junction boxes shall be made with waterproof splice kits.

E. Lugs shall be one piece, seamless, designed to terminate conductors specified in this Section. Material shall be compatible with the conductor material. Two hole with standard barrels and compression terminations.

PART 3 EXECUTION

3.01 APPLICATION

A. Service entrance conductors for underground installations in raceways shall be Type "XHHW-2."

B. All branch circuits, feeders and control wiring shall be Type "THHN/THWN-2."

C. Unless otherwise noted, minimum wire size for power branch circuits shall be No. 12 AWG and for control and auxiliary systems No. 14 AWG. Wire size for branch circuit homeruns shall be as indicated in the panelboard schedules. Remainder of branch circuit shall be No. 12 AWG, unless noted otherwise.

D. Type "MC" cable may be used for normal power concealed branch circuit wiring in dry locations above ceilings between luminaires and in walls between outlets. Homeruns, multi-wire branch circuits, circuit runs with multiple circuits and special purpose outlets shall occur in conduit. Conversion from "MC" cable to conduit shall occur within 10 feet of first utilization device connection to circuit. The use of Type "MC" cable for emergency branch circuits is not permitted. "MC" cable shall not be used in any exposed areas.

E. Type "SOW-A" shall be used for cord drops and portable appliance connections such as make up connections to shop or kitchen equipment. Hard service cord with stainless steel, wire mesh, strain relief device at terminations to suit application.

F. All conductors shall be copper, unless specifically noted on the Drawings, where conductors may be aluminum XHHW-2 wiring. Terminations on both ends shall be made with aluminum alloy, long barrel, one or two holes, high compression crimp lug connectors on cleaned ends protected with anti-corrosion joint compound. Cable ampacity and conduit size shall be in accordance with National Electrical Code tables. All switchboards, panelboards, safety switches, transformers, etc. shall come factory prepared with appropriate bus terminators to accept high compression crimp lug connectors. Equipment shall have sufficient wire bending space.

G. Aluminum conductors shall only be used for feeders to electrical equipment.

3.02 INSTALLATION

A. Install electrical cables, wires and connectors as indicated, in compliance with Manufacturer's written instructions, applicable requirements of NEC and NECA'S "Standard Installation," and in accordance with recognized industry practices.

B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.

C. No wire may be pulled until masonry and concrete is in place. Free ends and loops at boxes and enclosures are to be pushed back in box and protected by blank covers or other means until the interior painting and decorating work is completed.

D. Leave at least 6 inches of free conductor at all outlets except where conductors are intended to loop without joints through outlets for luminaires or wiring devices hookups.

E. Wire color and code shall be used as follows:

	120/208 Volt	277/480 Volt
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray

Ground	Green	Green
Isolated Ground	Green w/White Stripe	

Emergency: Same as normal, but with 1/2 inch red tape wrapped twice around wire at maximum 12 inch intervals at access points.

F. All circuits shall have separate neutral conductors run for each phase conductor. Provide separate neutral conductor between each dimmer and load.

G. Number of branch circuit conductors in a conduit including switch legs and neutral conductors shall not exceed nine (9) conductors. Conductors shall be derated in accordance with NEC Article 310 when more than three (3) current carrying conductors are installed in a raceway.

H. Branch circuits shall be connected as numbered on the Drawings. Test and permanently tag by circuit number each circuit phase conductor in panelboard gutter before connecting to panelboard. Numbered adhesive tapes may be used at Contractor's option. Group neutral conductor and associated phase conductors with cable ties.

I. Where a feeder or branch circuit exceeds the terminating lug size, the Contractor shall use an appropriate adapter fitting to reduce cable size. Cutting of conductor strands is not permitted.

J. Emergency circuit wiring and ground fault circuit breaker wiring shall be installed in separate conduits from all other wiring.

K. Use pulling means, including fish tape, cable or rope, and manufacturer approved compound or lubricant which will not damage raceway or deteriorate insulation. Do not exceed manufacturer’s recommended maximum pulling tensions and sidewall pressure values.

L. Branch circuit conductor splices shall be kept to a minimum. Feeder conductors shall have no splices.

M. Any equipment having multiple power connections shall have a warning label attached to each source where it connects to the equipment.

N. Subsequent to wire and cable hookups, energize circuitry and demonstrate functioning in accordance with requirements.

O. Division 26 Contractor shall provide cords and plugs for equipment furnished by General Trades Contractor which is intended or shown for connection to a receptacle but not furnished with the equipment.

P. Type "MC" cable shall be supported and secured at intervals not exceeding 6 feet with approved steel or malleable iron cable straps, clamps or hangers. Install "anti-short" bushings on all "MC" cable ends.

Q. Cables shall be supported inside of conduits and pullboxes as required by NEC in vertical risers. Provide pullboxes located as required – coordinate locations with Owner’s representative.

R. Each conduit in a parallel run shall contain all phases and neutral and equipment grounding conductors as a set. Phase conductors shall not be run in separate conduits.

3.03 CONDUCTOR SIZING

A. Branch circuit conduit routing is not shown on the plans and is left to the discretion of the Contractor. Minimum wire size for 20A, 120 volt branch circuits shall be as follows, unless specifically noted on the Drawings:

Conductor Size	Maximum Conductor Length
#12 AWG	100 feet
#10 AWG	150 feet
#8 AWG	250 feet
#6 AWG	400 feet

B. Wire size for under floor ducts shall be #8 AWG (minimum).

C. Do not purchase nor install cabling to equipment with VFD's until lug size can be verified with actual equipment submittals. If cabling size shown is larger than the lug can accommodate, provide a disconnect switch or wireway at equipment and reduce cabling to maximum size that fit into the lugs.

3.04 TESTING

A. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

B. Prior to energization, test cable and wire for continuity of circuitry and for short circuits.

END OF SECTION

SECTION 26 05 26
GROUNDING & BONDING

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install a complete grounding system as shown on the Drawings and specified herein. Provide all accessories as necessary for a complete system.

B. All components of the electrical system shall be grounded and bonded including: raceways, enclosures, receptacles, motors, controllers, panelboards, contactors, luminaires, emergency generators, transfer switches, and all other electrical components and subsystems.

1.02 REQUIREMENTS

A. The Division 26 Contractor shall work with the Division 27 Contractor. The Division 26 Contractor shall be responsible for the grounding system and include the telecommunications grounding listed in 26 05 27, Section 1.02.B.1. All applicable requirements listed in 26 05 27 shall be provided.

1.03 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards and NEC Article 250.

B. Comply with UL 467 for grounding and bonding materials and equipment.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Plans showing dimensioned locations of grounding features including, but not limited to the following:
1. Test wells.
2. Grounding rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

C. Field Quality Control Reports

1.05 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Connectors and Grounding Electrodes
1. Burndy, Hubbell
2. ERICO, nVent
3. Harger Lightning & Grounding
4. ILSCO

5. O-Z/Gedney, Emerson Electric Co.
6. Thomas & Betts, ABB Group

B. Exothermic Weld
1. Cadweld by ERICO Products, Inc.
2. Ultraweld by Harger

C. Low Resistivity Backfill
1. TerraFill by ALLTEC Corporation
2. GEM by ERICO Products, Inc.
3. Power Fill by LORESCO International, Inc.
4. Ultrafill by Harger

PART 2 PRODUCTS

2.01 DRIVEN GROUND ROD

A. Ground rod shall be copper-clad steel, 3/4 inch minimum diameter, 10 foot length.

2.02 CONDUCTORS, CLAMPS AND CONNECTORS

A. Insulated Conductors: Refer to Section 26 05 10, "Wire and Cable."

B. Bare Copper Conductors:
1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Clamps and Connectors
1. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless, compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
3. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
4. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
5. Conduit Hubs: Mechanical type, terminal with threaded hub.
6. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
7. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

8. Water Pipe Clamps:
   a. Mechanical type, two pieces with stainless steel bolts. Bronze listed for direct burial.
   b. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.03 EXOTHERMIC WELD

A. Exothermic welds shall be powdered copper oxide and aluminum to form a molded homogeneous copper joint connection between the copper conductor and the material being bonded to.

2.04 SINGLE POINT GROUND BUS BAR

A. Bus bar shall be minimum size 1/4" x 2" x 24" flat copper, wall mounted on standoff insulators.

PART 3 EXECUTION

3.01 INSTALLATION

A. Grounding Conductors
   1. Insulated Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
   2. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
      a. Bury at least 24 inches below grade.
      b. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
   3. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
   4. Conductor Terminations and Connections:
      a. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
      b. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
      c. Connections to Ground Rods at Test Wells: Bolted connectors.
      d. Connections to Structural Steel: Welded connectors.

B. System Grounding Connections
   1. The service entrance conductors shall be grounded in accordance with NEC Article 250.24. The grounding electrode conductor shall be connected to the grounded service conductors at the terminal or bus at the main service disconnecting means. A grounding connection shall not be made to any grounded circuit conductor on the load side of the service disconnecting means, except for additional separately derived systems.
   2. All separately derived alternating current systems, such as 480 volt delta to 208/120 volt wye transformers, UPS systems, emergency generators, etc., shall be grounded and bonded as required in NEC Article 250.30.

C. Enclosure and Equipment Grounding
   1. Metal enclosures or raceways for conductors or equipment shall be grounded.
   2. Exposed noncurrent-carrying metal parts of fixed equipment likely to become energized shall be grounded.
   3. Exposed noncurrent-carrying metal parts of switchboard frames and structures, motor frames, enclosures for motor controllers, and luminaires shall be grounded.

D. Method of Grounding
   1. Equipment grounding connections at service equipment shall be made by bonding the equipment grounding conductor to the grounded service conductor and the grounding electrode conductor.
   2. The grounding electrode conductor shall connect the equipment grounding conductors, the grounded service conductors and the service entrance enclosures to the grounding electrode.
   3. A main bonding jumper shall connect the equipment grounding conductors and the service equipment enclosure to the grounded conductor within the service equipment.
   4. Provide separate green insulated equipment grounding conductors for all feeders and branch circuits.

E. Bonding
   1. Bonding shall be provided and conform to all requirements of NEC Article 250, Parts V and VII.

F. Grounding electrode system shall consist of all of the following components exothermically bonded together:
   1. The main domestic water service pipe ahead of any meter, and within 5 feet of entry into building. Comply with NEC 250.52(A)(1).
   2. Ufer Ground – 20 foot minimum length of re-bar, or Bare No. 4 AWG conductor embedded within concrete footer, with a No. 4 AWG conductor extended to single point grounding buss bar.
   3. The Steel Frame of the Building - At a column nearest to the service entrance equipment and at a point accessible to view. Comply with NEC 250.52(A)(2).
   4. Driven Ground Rods - Two ground rods, installed vertically into earth near the service entrance point and spaced 20 feet apart, with top 8 feet encased with low resistivity backfill. Comply with NEC 250.52 (A)(5).
   5. Counterpoise Ground Ring - Bare No. 2 AWG minimum stranded copper conductor installed at 30 inches below grade and 5 feet from building surrounding the entire building and encased with minimum of 4 inches low resistivity backfill. Bond from ring to nearest steel column every 100 feet around building.
   6. Single Point Ground Bus Bar - Bus bar installed adjacent to the service entrance switch gear with each grounding electrode system component listed above bonded to it.

G. Exterior luminaires and metal poles shall be grounded by the use of a manufacturer supplied ground lug or pigtail or by the use of ground clips fastened in bare metal that is free of paint. Poles shall be grounded to an equipment grounding conductor. Poles shall also have a driven ground rod installed at the bottom of their base excavation and bonded to pole.

H. Separately derived systems such as transformers, UPS systems, and emergency generators shall be grounded to the nearest building steel column. If building steel is not available, then ground to the nearest domestic cold water pipe. In addition, run a grounding electrode conductor back to the main service entrance ground point. Grounding electrode conductor shall be bonded to conduit at each end.
   1. Generator Electrode: The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

I. Motor terminal boxes shall be grounded by the use of a manufacturer supplied ground lug or by drilling and tapping a hole for a ground screw. Remove paint prior to making the connection.

J. Metal air ducts shall be bonded to the equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

K. Metal roofing and metal veneer siding shall be bonded to building steel or nearest grounding system connection with No. 6 AWG conductor every 100 feet.

L. A braided-type bonding jumper shall be installed around water meters and water heaters. Connect to pipe with bolted connectors.

M. Metal piping systems such as compressed air, natural gas, lab gases, vacuum, hot water, heating and chilled water HVAC systems, shall all be bonded to the grounding electrode system with No. 6 AWG conductors.

N. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode underground, exterior to the building. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

O. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

P. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 81 "Manholes and Handholes," and shall be at least 12 inches deep, with cover.
   1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

3.02 GROUNDING SYSTEM TESTING

A. Soil Resistivity
   1. Measure soil resistivity and record

B. Grounding System Resistance
   1. Ground system resistance measurements shall be taken and submitted to the Architect for approval before energizing equipment. Measurements shall be taken in dry weather, not less than 48 hours after rainfall.
   2. The test method used shall be the fall-of-potential method described in IEEE Standard 142. If it is not possible to use the fall-of-potential method, then the slope method of Dr. George Tag shall be used.
   3. Documentation shall include the following information:
      a. Sketch of site showing building, ground connection and test locations
      b. Location in feet of all test spikes
      c. Graphs showing all recorded data plotted
      d. A minimum of ten (10) data points shall be recorded

3.03 GROUNDING SYSTEM ADJUSTMENT

A. Where grounding system resistance test results are above 25 ohms (or above 5 ohms when bonded with a telecommunications bonding system per EIA/TIA 607-B), install additional driven ground rods spaced 20 feet apart until such a reading is achieved.

END OF SECTION

SECTION 26 05 27
TELECOMMUNICATIONS BONDING INFRASTRUCTURE

PART 1 GENERAL

1.01 REQUIREMENTS

A. The Division 27 Contractor shall work with the Division 26 Contractor who shall be responsible for the bonding and grounding system and shall follow Section 26 05 26, "Grounding & Bonding" requirements and include the telecommunications bonding and grounding listed in Section 1.02.B.1, below. The Division 27 Contractor shall be responsible for bonding work identified in Section 1.02.B.2 below.

B. The Contractor shall supply a bonding system as shown on the Drawings, specified herein and based upon ANSI/TIA-607-D Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

1.02 SCOPE OF WORK

A. The aim of this document is to install a proper bonding system to achieve the following needs:
   1. Safety from electrical hazards
   2. Reliable signal reference within the network
   3. Satisfactory and/or enhanced electromagnetic performance of the network

B. The "Bonding and Grounding System" shall be a shared responsibility between the Division 26 (Electrical) Contractor and Division 27 (Low Voltage) Contractor. See schematic diagram on drawings. The Division 27 Contractor shall be responsible for coordinating his/her work with the Division 26 Contractor and the General Contractor.
   1. The Division 26 Contractor shall supply and install the bonding and grounding system as specified in Section 26 05 26, "Grounding and Bonding" and also include the following:
      a. Provide the PBB (Primary Bonding Busbar) in the MTR (Main Technology Room/Demarc room).
      b. The PBB shall be connected to an earth ground (ground loop surrounding the building, if available) and the building steel.
      c. Provide as SBB (Secondary Bonding Busbar) in each TR located throughout the facility.
      d. Each SBB shall be connected to building steel and the equipment ground terminal of the nearest AC electrical panelboard serving the telecommunications equipment in the TR.
      e. Provide and connect the TBB (Telecommunications Bonding Backbone) from the PBB to all SBBs. Provide the Secondary Bonding Conductors (SBCs).
   2. The Division 27 Contractor shall:
      a. Connect via compression connectors all equipment, ladder rack, basket rack, telecom racks, cabinets, conduits, sleeves, and other equipment, in each TR and/or MTR, with bonding conductors to the SBB and/or PBB located in each TR and/or MTR.

C. The Division 27 Contractor shall work with and coordinate with the Division 26 Contractor to ensure that all aspects of the grounding system are complete and operational.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Scaled and dimensioned plans shall be submitted that indicate the Contractor's understanding of the location of busbars, the bonding requirements, and all bonding locations and types.

C. Field Quality Control Reports

PART 2 PRODUCTS

2.01 BUSBARS

A. The PBB (Primary Bonding Busbar) shall be solid copper busbar, 1/4 inch thick x 4 inches high x 12 inches (minimum) length, as required to be supplied by the Division 26 Contractor.

B. The SBB (Secondary Bonding Busbar) shall be solid copper busbar, 1/4 inch thick x 2 inches high x 10 inches (minimum) length, as required to be supplied by the Division 26 Contractor.

C. The PBB and SBB shall be drilled with holes per NEMA standard for attaching compression fittings to be supplied by the Division 26 Contractor.

D. Vertical Rack Bonding Busbars (RBBs) shall be provided for all equipment racks by the Division 27 Contractor. RBBs provide clean bond to any rack mounted equipment regardless of whether or not equipment has an integrated grounding terminal. RBBs shall be a minimum 45U with universal mounting hole pattern.

2.02 COPPER CABLES

A. All wire used for telecommunications bonding purposes shall be stranded copper and identified with green insulation. Non-insulated wire shall use green tape wrap at each termination point. When conductors are insulated, they shall be listed for the application (e.g., plenum). The bonding conductors shall not decrease in size as the bonding path moves closer to the termination point of the grounding electrode system.

B. If not shown on Drawings, Division 26 Contractor shall size bonding conductors to be used for connecting the SBBs to the PBB and the building steel.

C. Telecommunications Bonding Backbone (TBB) Conductor
1. The TBB is a conductor that equalizes potentials between TRs on multiple floors of a building with an ultimate connection to the PBB.
2. The TBB shall be installed in conduit.
3. The TBB shall be minimum conductor size #6 AWG, and sized at 2 kcmil per linear foot up to a maximum size of 750 kcmil. These sizes are based upon TBB length per ANSI/TIA-607 recommendations. The Division 26 Contractor shall bring to the attention of the A/E anywhere the TBB sizing appears insufficient per the Table below.

Sizing of the TBB	
TBB Length in Linear Feet	TBB Size (AWG)
Less than 13	6
14-20	4
21-26	3
27-33	2
34-41	1
42-52	1/0
53-66	2/0
67-84	3/0
85-105	4/0
106-125	250 kcmil
126-150	300 kcmil
151-175	350 kcmil
176-250	500 kcmil
251-300	600 kcmil
Greater than 301	750 kcmil

D. Backbone Bonding Conductor (BBC)
1. The BBC is a conductor that equalizes potentials between TRs on the same floor.
2. The BBC shall be installed in conduit.
3. Multi-story buildings with multiple risers (multiple TBBs) shall employ a BBC between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The BBC conductor shall be no smaller than the largest sized TBB.

E. Telecommunications Bonding Conductor (TBC)
1. The TBC is a conductor that bonds the PBB to the AC grounding (earthing) electrode system.
2. The TBC shall be installed in conduit.
3. The TBC conductor shall be no smaller than the largest sized TBB.

F. Telecommunications Equipment Bonding Conductor (TEBC)
1. The TEBC is a conductor that bonds the equipment racks to the SBB or PBB.
2. Racks and cabinets shall have individual rack bonding conductors (RBC) bonding to the TEBC.
3. In smaller TRs (3-5 racks), it is acceptable to have TEBCs that go directly from each individual rack to the SBB.

G. Alternating Current Equipment Ground (ACEG)
1. The ACEG is a conductor that bonds the nearest AC electrical panelboard serving the telecommunications equipment in the TR to the SBB or PBB.

H. Secondary Bonding Conductor (SBC)
1. The SBC connects the SBB to the TBB.
2. The SBC shall be sized to be a minimum of the greater of #6 AWG or the largest conductor bonded to the associated SBB.

I. Unit Bonding Conductor (UBC)
   1. The UBC connects rack-mounted equipment to the RBB.

2.03 EXOTHERMIC WELD

A. Exothermic welds shall be powdered copper oxide and aluminum to form a molded homogeneous copper joint connection between the copper conductor and the material being bonded to.

2.04 LUGS

A. All lugs shall be two-hole and have a long barrel construction with sufficient length to allow for two discrete crimps.

2.05 HTAPs

A. All HTAPs shall contain a crimp location for the main cable run and a minimum of one tap.

B. All HTAPs shall be provided with a clear cover.

PART 3 EXECUTION

3.01 WORK TO BE DONE

A. The Division 26 Contractor shall provide the PBB and the SBB in each room requiring bonding.

B. The Division 26 Contractor shall provide all bonding cabling required connecting the PBB to earth and building steel and all cabling required connecting the SBBs to building steel and to the PBB.

C. The Division 26 Contractor shall provide all BBC conductors where required.

D. The Division 27 Contractor shall provide and connect all bonding cables required in the MTR and TR to properly bond all equipment to the PBB and SBB.

3.02 INSTALLATION

A. Conductor Terminations and Connections
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Exothermic welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Exothermic welded connectors.
   5. Connections to PBB, SBB, and RBB: Compression two-hole lugs or exothermic welded connectors.

B. All bonding connections shall be prepared by cleaning and applying appropriate antioxidant joint compound.

3.03 TESTING

A. The telecommunications bonding and grounding system shall be tested with an earth ground resistance tester used in the two-point testing method. If the resistance value is less than 0.1 Ohm between the two test points, the bonding is acceptable.

B. Tests to be conducted:
1. The installer and tester must be certified to conduct the testing.
2. Test between the PBB and the service equipment (power) ground.
3. Test between the PBB and each SBB in the system.
4. Test between the SBB and:
   a. Equipment racks
   b. Cable tray
   c. Ladder rack
   d. Telecommunications conduits
   e. Electronic equipment
5. Test results shall be recorded and submitted to Owner and A/E. Include these test results in the "Record and Information Manual."

3.04 LABELING

A. The Division 27 Contractor shall provide labeling for all bonding conductors that originate in or are routed through the MTRs and TRs. Labels shall include the following or similar language, “If this connector or cable is loose or must be removed, please call the building telecommunications manager.”

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install complete hangers, supports and concrete inserts as required for the installation of conduits, cabinets, transformers and equipment installed under Division 26.

B. Provide all beam clamps, expansion anchors, threaded rod, framing steel and hardware as required.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 MANUFACTURERS

A. Hangers, Supports and Inserts
1. GTE/Unistrut International Inc.
2. Flex-Strut
3. Kindorf/Midland Ross Corporation
4. Grinnell
5. Tufstrut - Pilgrim Technical Inc.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conduits or raceways shall be securely supported and anchored with proper devices, using lead shields in walls or sides of beams, expansion shields or other approved type device for direct down-pull loads. Minerallac type hanger shall be limited to above ceilings. Holes made in walls or ceilings for use with anchoring devices shall be covered by large steel washers. Include special hangers, as required. Minerallac type fittings shall not be permitted within 8 feet of the floor surface where exposed raceways are installed.

B. Hangers shall be individual ring or clevis type, one hole straps or multiple trapeze hangers.

2.02 STRUCTURAL ATTACHMENTS

A. Concrete: Use Grinnell Fig. 285, or equal, Light Weight concrete insert for loads up to 400 lbs., or Grinnell Fig. 282, or equal, Universal Concrete insert for loads up to 1430 lbs.

B. Steel Beams: Where pipe size is 2 inches or less, use Grinnell Figure 87 or equal, Malleable iron C-Clamp and Retaining Clip. Where pipe size is over 2 inches, use Grinnell Figure 229, or equal.

C. Intermediate Attachments: Continuous threaded rod shall be used wherever possible. No chain, wire or perforated strap shall be used. Up to 2 inches trade size pipe use 3/8 inch (minimum) rod, 2 1/2 inches and larger use 1/2 inch (minimum) rod.

D. Pipe Attachments: For steel pipe use Grinnell Figure 115 Ring and Turnbuckle Adjuster, or Figure 260 Clevis.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conduits shall be supported to meet the conditions as required using proper type and size straps, clamps, and hangers.

B. Exposed conduits shall be installed parallel with or at right angles to building structure, fastened at least every 8 feet and at both sides of each outlet, except at one side only of conduit terminating outlets. Conduits shall be installed tight to structure and beams/joists. Coordinate exposed conduit routing with Architect prior installation.

C. Conduit risers shall be supported with friction clamps with two point bearing anchored to building construction and at every floor.

D. The following hanger methods are not permitted:
1. Wood plugs
2. Perforated band iron
3. Hook chain supports
4. Bailing wire, etc.
5. Minerallacs where previously mentioned
6. Friction type clamps, such as hammer on clips

E. Whenever possible, use supports, clamps, hangers, etc., designed especially for the equipment to be installed.

F. The maximum permitted load on hanger rod, plain or all-thread, shall be as follows:
1. 1/4 inch size - 750 pounds
2. 3/8 inch size - 1000 pounds
3. 1/2 inch size - 2000 pounds
4. 5/8 inch size - 3000 pounds
5. The minimum size hanger rod permitted is 1/4 inch size.

G. Any supports exposed to weather, shall be cleaned, primed and painted.

END OF SECTION

SECTION 26 05 33
CONDUIT AND FITTINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide complete grounded conduit systems for all electrical conductors.

B. All conduits shown on the Drawings shall meet NEC fill requirements for the conductors enclosed.

C. Conduit raceway systems shall be made mechanically tight and electrically continuous throughout. All metal raceway systems shall be grounded.

D. Refer to Section 26 05 43, "Underground Raceways" for all conduits located within or below slab-on-grade floors, and exterior to the building foundation.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Conduit shall be in accordance with applicable NEC Articles.

PART 2 PRODUCTS

2.01 RIGID (RMC) AND INTERMEDIATE METAL CONDUIT (IMC)

A. Conduit shall be steel, hot dipped zinc galvanized (minimum 0.0008 inch thick) inside and out, with circular cross section, uniform wall thickness, continuously welded seams and chamfered threaded ends. Conduit shall be furnished in 10 foot standard lengths.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. EMT shall be zinc galvanized (minimum 0.0008 inch thick) inside and out, with circular cross section, uniform wall thickness and continuously welded seams. EMT shall be furnished in 10 foot standard lengths.

2.03 FLEXIBLE METAL CONDUIT (FMC)

A. Conduit shall be steel or aluminum, hot dipped zinc galvanized inside and out and made from one continuous length of high grade strip of uniform weight and thickness shaped into interlocking convolutions with smooth interior and exterior surfaces. Conduit shall be provided in standard coil lengths.

2.04 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Conduit shall be hot dipped zinc galvanized inside and out and made from one continuous length of high grade steel strip of uniform weight and thickness shaped into interlocking convolutions with smooth interior and exterior surfaces. Conduit shall be provided in standard coil lengths.

B. Conduit shall have a continuous PVC jacket enclosing it.

2.05 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. The conduit shall be fiberglass conduit, also known as Reinforced Thermosetting Resin Conduit (RTRC), manufactured using the single circuit filament winding process. Multi circuit windings are not allowed. UL 2515 listed for above ground installation. The conduit shall have a winding angle as close as possible to 54.75 degrees. Winding mandrels shall be straight and true so as to produce a non-tapered conduit. Tapering is allowed at the belled end. The internal conduit and elbow walls shall be smooth, and all fibers embedded in the epoxy.

B. The resin system shall be epoxy based, without fillers using an anhydride curing agent. The fiberglass shall consist of continuous E-glass Grade “A” roving. All additive for increasing flame spread and lowering smoke density shall be halogen free, i.e. not contain chlorine or bromine and shall meet NEMA TC 14 Standards.

C. Carbon black shall be used as ultra violet inhibitor to protect the conduit and fittings during storage and exposure to the outdoors. Conduit and elbows shall be black in color.

D. A two-part adhesive, epoxy resin system designed to permanently bond fittings and joints of conduit shall be properly mixed and applied at manufacturer specified ambient temperatures.

2.06 CONDUIT FITTINGS

A. All RMC, IMC, and EMT fittings shall be galvanized steel. Connectors and couplings shall be threaded, set screw or compression type, concrete-tight.

B. Conduit bodies shall be threaded steel type. Provide neoprene cover gaskets for conduit body covers exposed to the weather.

C. Expansion fittings, shall be O-Z/Gedney Type "AX" for RMC and Type "TX" for EMT. For IMC applications, a 15 inch minimum length of RMC shall be used with a Type "AX" expansion fitting. Provide O-Z/Gedney Type "BJ" bonding jumpers at all expansion fittings.

D. Sealing fittings shall be Crouse Hinds Type EYD or Appleton Type EYD, with drain.

E. RMC and IMC conduit bushings shall be of the insulated type with phenolic thermosetting insulation molded to a hot dipped galvanized steel body of the threaded type.

F. EMT fittings shall be of the insulated throat type. Fittings larger than 2 1/2 inches shall have threaded bushings installed as described in Paragraph E above.

G. Conduits larger than 1 inch shall have grounding type bushings.

H. Fiberglass conduit fittings, elbows, and accessories shall be manufactured using one of two manufacturing procedures. The first method shall use the same process, methods, and components as used to manufacture the fiberglass conduit. The second method shall use the compression molding process, Sheet Molding Compound (SMC) for the manufacture of the finished component. The SMC material shall be a vinyl ester resin with +30% reinforcement of glass. The glass fibers should be approximately 1 inch in length. The SMC material shall be fire resistant to UL 2515 specifications and shall be halogen free. Plastic duct plugs shall be manufactured from PVC.

2.07 ROOF PENETRATIONS

A. Use prefabricated pipe flashing of ultra-violet resistant EDPM rubber with ribbed aluminum base.

B. Pate, Shipman, or Thy-Curb.

2.08 ROOF SUPPORTS

A. Rooftop conduit supports shall be UL listed for glue down installation.

PART 3 EXECUTION

3.01 APPLICATION

A. All conduit shall be rigid metal conduit, unless noted otherwise below, minimum 3/4 inch trade size.

B. EMT may only be used in these locations:
1. Within interior partitions and exterior walls
2. Above suspended ceilings inside building
3. Exposed above 9 feet A.F.F. inside building (except in wet, hazardous, or corrosive locations)
4. Exposed above electrical equipment in electrical and mechanical rooms.

C. Intermediate metal conduit may be used at the Contractor's option in lieu of rigid steel conduit within the building interior.

D. Flexible metal conduit up to 6 feet in length shall be used for connections to lighting fixtures. A green grounding conductor shall be installed in each flexible conduit as specified in Section 26 05 26, "Grounding." All runs shall be terminated in insulated flexible conduit fittings in accordance with NEC. Minimum size to be 1/2 inch.

E. Liquid tight flexible metal conduit (up to 3 feet in length) and appropriate fittings shall be used for connections to motors, engine/generators, and vibrating equipment. A green grounding conductor shall be installed in each flexible conduit as specified in Section 26 05 26, "Grounding." All runs shall be terminated in insulated flexible conduit fittings in accordance with NEC. Minimum size to be 1/2 inch.

F. EMT shall not be installed on the underside of metal roof decking.

G. RMC conduit shall be used on roofs with appropriate expansion fittings.

3.02 INSTALLATION

A. Generally, all conduits shall be concealed with runs installed parallel and perpendicular to walls and floor. Exposed conduits below 9 feet will be permitted only in electrical and mechanical rooms. Anywhere else at the discretion of the Architect or where specifically noted on the Drawings. In these cases, install conduit escutcheon plates around conduit penetration, sized to cover the conduit sleeve. Submit proposed routing of exposed conduits in finished spaces with Architect prior to installation.

B. Branch circuit conduits shall not be run within concrete floors except for short runs to floor boxes.

C. Conduit shall be securely and rigidly fastened in place with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps and beam clamps shall have strap or rod-type retainers.

D. Conduit support fastenings shall be by:
1. Wood screws to wood
2. Toggle bolts in hollow concrete masonry units
3. Expansion bolts in concrete or brick
4. Machine screws, welded threaded studs on steel work
5. Nail-type nylon anchors or threaded studs driven by a powder charge and provided with lock washers and nuts for concrete, brick or steel work
6. Conduit shall not be supported using wire or nylon ties.

E. In areas without ceilings, conduits shall be run as high as possible attached to the structure of the roof, or of the floor deck above. Do not attach directly to the metal deck. Conduits shall be run next to walls as inconspicuously as possible. In finished areas exposed to public view without ceilings, all work shall be installed in an aesthetically acceptable manner. The Architect reserves the right to require the Contractor to make changes as necessary to equipment installation that is unsuitable for public view due to poor workmanship.

F. Install conduit sleeves for all conduit penetrations through floors, masonry walls, and fire rated walls. Refer to Section 03 30 00, "Concrete" for spacing requirements. Sleeves shall be spaced a sufficient distance apart to maintain fire ratings as required by the UL Fire Resistance Construction Manual.

G. Conduit shall be independently supported from elements of the building and shall not rest on, nor be supported from suspended ceilings. Boxes shall be fastened to structure independently from conduit system. Conduits shall not be attached to metal decking forming the roof or floor slab above.

H. Do not install conduits within poured concrete construction above grade, unless to flush floor outlets.

I. Lay out conduit system to avoid crossing building expansion joints. Where crossings are necessary, use expansion fittings.

J. All conduits shall be continuous from outlet to outlet or junction box, and installed complete before pulling conductors. Swab conduits free of dirt, grease and moisture before pulling conductors.

K. Install bushings on all RMC and IMC conduit ends. Install insulated throat fittings on all EMT conduit ends. Fasten conduit to boxes and cabinets using locknuts. Provide two (2) locknuts where required by the NEC, where insulating bushings are used and where bushings cannot be brought into firm contact with the box.

L. All conduits entering or leaving refrigerated, subject to different temperatures or moisture-laden spaces shall be sloped away from equipment and secured with sealing fittings. Secure conduits with threaded hubs to prevent air circulation and condensation.

M. Do not install conduits beneath nor above equipment generating heat such as boilers, heat exchangers or water heaters.

N. Provide a high strength pull cord in all empty conduits, and cap ends.

O. Maintain minimum clearances of 6 inches from parallel hot water piping and 4 inches from crossovers.

P. Provide conduit sleeves, seals and firestops in accordance with Section 26 00 55, "Sleeves, Seals and Firestops."

Q. Provide expansion joints in conduits run on roofs and exterior to building above grade. Provide proper roof flashing and sealing when penetrating roofs.

R. Install cable wedging plug type supports in all vertical conduit runs as required by NEC.

S. All conduits in hazardous locations shall be sealed in accordance with NEC Articles 500, 501, 502, and 503.

T. Do not exceed four (4) 90 degree bends in any conduit run without a pulling point. Provide pullboxes as required. Locate pullboxes in accessible areas. Coordinate locations with all other building Trades.

U. Roof support steel shall be galvanized.

END OF SECTION

SECTION 26 05 34
OUTLET BOXES

PART 1 GENERAL

1.01 DESCRIPTION

A. Outlets shall be provided for devices, luminaires, motors, and equipment connections, systems equipment connections, special outlets, and as otherwise required.

B. Outlet boxes shall be of sufficient size to provide free space for all conductors enclosed in the box. Boxes shall be not less than the minimum size required by NEC Article 314 for the number and size of conductors contained within.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Interior Outlet Boxes: Provide galvanized flat rolled sheet steel interior outlet wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

B. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.

C. Weatherproof Outlet Boxes: Provide corrosion-resistant cast aluminum, weatherproof outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.

D. Luminaire outlet boxes shall be standard 4 inch octagonal, minimum 1 1/2 inches deep.

E. Flush device boxes in masonry walls to be masonry boxes designed for the purpose, or 4 inch square boxes with raised covers designed for masonry.

F. Wiring device boxes for surface conduit work and located in potentially damp areas shall be FS series cast aluminum boxes.

G. Where outlet boxes are to be cast in concrete slabs, they shall be boxes designed for concrete installation.

H. Flush device boxes shall be 4 inch square, 2 1/8 inch deep boxes with plaster covers or gangable 2 1/2 inch deep boxes. Shallow 1 1/2 inch deep gangable boxes may be used only in demountable partitions and in other walls too thin for standard depth boxes.

I. Low voltage boxes are identified in Section 26 05 35, “Low Voltage Outlet Boxes”.

PART 3 EXECUTION

3.01 INSTALLATION

A. All outlet boxes upon which luminaires are to be installed shall be equipped with 3/8 inch fixture studs. All outlet boxes shall be installed vertically plumb within 3 degrees.

B. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported. Framing members of suspended ceiling systems shall not be permitted as a support.

C. Flush boxes shall finish within 1/4 inch of surface of non-combustible materials. Boxes shall not project beyond finished surfaces.

D. Flush luminaires in lay-in ceilings shall have branch circuit conduit terminated in a junction box above ceiling, but accessible through ceiling opening and located at least one foot away from the luminaire. Pre-wired incandescent luminaires may have the branch circuit conduit terminate in the luminaire junction box provided the box is sized sufficient for the wire and UL labeled for 90 degrees C wire.

E. Locations of all outlets are approximate. Final location shall be verified with the Architect in the field prior to installation.

F. Install knockout closures for unused openings.

G. Outlet boxes installed on opposite sides of a fire rated wall shall have a minimum of 24 inch spacing between adjacent boxes.

H. All outlet boxes shall use stud to stud box brackets with far side supports.

I. "Through-wall" type boxes shall not be used.

J. Boxes shall not be installed in a "back-to-back" manner. Boxes shall be spaced at least 10 inches apart where in opposite walls within the same stud cavity, unless a sound absorptive barrier is placed between boxes.

END OF SECTION

SECTION 26 05 35
LOW VOLTAGE OUTLET BOXES

PART 1 GENERAL

1.01 DESCRIPTION

A. Low Voltage Outlet boxes shall be provided for IT devices, AV devices, security devices, special technology outlets, and as otherwise required.

B. Low Voltage Outlet boxes shall be of sufficient size to provide free space for all conductors/cables enclosed in the box and to not exceed the minimum band radius for any cable. Boxes shall be not less than the minimum size required by NEC Article 314 for the number and size of conductors contained within.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets
   2. Layout drawings for television and monitor outlet box locations

B. To be included in Record and Information Manuals:
   1. One (1) copy each of approved submittal

PART 2 PRODUCTS

2.01 LOW VOLTAGE OUTLET BOXES

A. Flush device boxes in masonry walls to be masonry boxes designed for the purpose with raised covers designed for masonry.

B. Where outlet boxes are to be cast in concrete slabs, they shall be boxes designed for concrete installation.

C. Flush boxes for data / voice cabling shall be 4 11/16 inches square by 2 1/8 inches deep with one (1) gang plaster ring installed. Outlet boxes shall accommodate 1 inch conduit as required.

D. Unless otherwise noted, all television and monitor locations with a TV symbol shall use an recessed outlet box for both power and low-voltage. Basis of design is Legrand TV2MW, with equivalents by Leviton, Hubbell, FSR, and Peerless. All TV locations on the drawings that are designated as future monitors shall have cover furnished and installed.

E. Flush boxes for audio / video cabling (other than television and monitor locations) shall be 4 11/16 inches square by 3 1/4 inches deep with one (1) gang plaster ring cover installed. Coverplates shall be blank stainless steel. Outlet boxes shall have knockouts for 1 1/4 inch conduits, and knockouts for up to 2 inch conduits as required.

F. Flush boxes for security cabling 4 11/16 inches square by 2 1/8 inches deep with one (1) gang plaster ring cover installed. Coverplates shall be blank stainless steel. Outlet boxes shall accommodate 3/4 inch conduits as required.

G. Flush boxes for nurse call cabling shall be sized per manufacturer recommendation for each device type. Outlet boxes shall accommodate minimum 3/4 inch conduits as required.

PART 3 EXECUTION

3.01 INSTALLATION

A. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported. Framing members of suspended ceiling systems shall not be permitted as a support.

B. Flush boxes shall finish within 1/4 inch of surface of non-combustible materials. Boxes shall not project beyond finished surfaces.

C. Locations of all outlets are approximate. Final location shall be verified with the Architect in the field prior to installation.

D. Install knockout closures for unused openings.

E. Outlet boxes installed on opposite sides of a fire rated wall shall have a minimum of 24 inch spacing between adjacent boxes.

F. All outlet boxes shall use stud to stud box brackets with far side supports.

G. "Through-wall" type boxes shall not be used.

H. Boxes shall not be installed in a "back-to-back" manner. Boxes shall be spaced at least 10 inches apart where in opposite walls within the same stud cavity unless a sound absorptive barrier is placed between boxes.

END OF SECTION

SECTION 26 05 36
PULL AND JUNCTION BOXES

PART 1 GENERAL

1.01 DESCRIPTION

A. Pull or junction boxes shall be provided in all raceway systems where required to avoid an excessive number of bends, to facilitate wire pulling, or to afford required access to the raceway system. Maximum distance between boxes in raceway systems shall not exceed 100 feet.

B. Pull and junction boxes shall provide adequate space and dimensions for the installation of conductors in accordance with NEC Article 314.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

PART 2 PRODUCTS

2.01 PULL AND JUNCTION BOXES

A. Pull and Junction Boxes: Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers, of types, shapes and sizes, to suit each respective location and installation. Minimum size shall be 4 inch square, 2 1/8 inch deep box.

B. Concealed pull or junction boxes shall be flush in finished walls, located near the floor and provided with flush type covers; blank device plates in case of outlet type boxes and flat plates prime painted and secured with flat head screws in the case of larger boxes. Surface junction boxes in utility areas shall be without knockouts, shall have close fitting screw covers and shall be finished in medium gray enamel.

C. Boxes exposed to the weather shall be weatherproof type as required by NEC.

D. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes to suit respective uses and installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pull and junction boxes, complying with Manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in compliance with recognized industry practices.

B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

C. Pull and junction boxes shall be located in utility areas or above accessible ceiling systems wherever possible. Boxes located in exposed areas shall be brought to the attention of the Architect prior to installation.

D. Pull and junction boxes shall be sized in accordance with the NEC for both contained conductors and conduit entrances and exits.

E. Fasten boxes rigidly to structural surfaces, or solidly imbed electrical boxes in concrete or masonry.

F. Boxes not otherwise accessible in ceilings and walls shall be made accessible by an access panel.

G. Provide watertight boxes, slip expansions or bonding jumpers where dictated by construction conditions.

END OF SECTION

SECTION 26 05 43
UNDERGROUND RACEWAYS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install all items necessary for a complete installation of underground and under slab raceway systems herein specified and as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Concrete work shall conform to the requirements of ACI 301-89.

C. Refer to Section 03 30 00, "Cast-in-Place Concrete."

D. Refer to Section 26 00 25, "Excavation, Backfill, and Protection of Utilities" for backfill requirements.

PART 2 PRODUCTS

2.01 RACEWAY AND FITTINGS

A. PVC conduit shall be rigid non-metallic, Schedule 40 heavywall, UL approved for direct earth burial.

B. Rigid galvanized steel conduit and associated fittings shall be the same as specified under Section 26 05 33, "Conduit and Fittings."

C. Fiberglass conduit and associated fittings shall be the same as specified under Section 26 05 23, “Conduit and Fittings”.

D. PVC conduit fittings shall be slip joint type with cement furnished and recommended by the Manufacturer.

E. Conduit elbows shall be rigid metal or fiberglass and be long radius type.

2.02 CONCRETE ENVELOPES FOR RACEWAYS

A. Concrete used for the encasement of raceways shall have a 28 day compressive strength of 3000 psi. Refer to Section 03 30 00, "Cast-in-Place Concrete" for information concerning concrete to be furnished under this Section.

B. Colored Concrete
   1. Cement color shall be 95% pure mineral oxide (90% pure iron oxide) finely milled to pass a 325 mesh. Carbon added for darker shades shall be wettable and shall not exceed 3% of the weight of portland cement. Color pigments shall be light fast, wettable, weather resistant, alkali resistant, and free of deleterious fillers and extenders.
   2. Color shall be Solomon Grind #140 or equal.

PART 3 EXECUTION

3.01 APPLICATION

A. Underground raceways shall be rigid galvanized steel conduit or Schedule 40 heavywall PVC.

B. Use only rigid galvanized steel raceways for:
   1. Raceways underneath electric equipment pads
   2. Terminal pole risers
   3. All elbows both horizontal and vertical(45 degrees and greater)
   4. Metering conduit
   5. Additionally, where noted on the Drawings
   6. Fiberglass long sweep radius elbows are acceptable in lieu of RGS.

C. Underground raceways shall be encased in a concrete envelope for the following installations:
   1. Primary voltage cable raceways exterior to the building
   2. Installed beneath footings
   3. Secondary voltage electric service entrance raceways between service transformer and service entrance equipment
   4. Voice/data ductbanks exterior to the building
   5. Raceways between emergency generators and service equipment
   6. Additionally, where noted on the Drawings

D. Underground branch circuit raceways shall be a minimum of 1 inch.

E. Branch circuit raceways (up to 1 1/2 inch size) may be run under slab-on-grade floors at bottom of gravel base. Only short runs of raceways connecting to floor boxes are permitted within the concrete of slab-on-grade floors.

F. Raceways larger than 1 1/2 inch shall be run at 30 inches below finished grade or floor slab.

3.02 INSTALLATION

A. All raceways shall have ends capped during construction to prevent entrance of mud or solids. Seal active raceways entering building from underground raceway system. Cap spare raceways. Mark ends of future raceways with a stake at ground surface. Provide pull cord in all spare raceways.

B. Raceways shall be placed and sloped so that water will not enter into the building through them. Provide a pullbox in conduit runs to prevent water ingress where necessary.

C. For conduits located under slab-on-grade concrete floors, conduits shall be routed in a single layer. Where necessary for conduits to be routed in a stacked arrangement, concrete envelope shall be provided to prevent voids in the ductbank. In areas of high conduit concentration, such as under electrical switchgear, complete concrete backfill of excavation shall be provided to avoid compromising support of concrete floor.

D. Refer to Section 26 00 55, "Sleeves, Seals and Firestops" for raceways installed through below grade walls and floors.

E. Spacers shall be used to provide a minimum 7 1/2 inch separation between adjacent centers of raceways in ductbanks as shown in the National Electrical Code for all conduits, both exterior, and within the limits of the building foundation, regardless of voltage. Ductbanks shall be limited to only two (2) conduits wide arrays unless at ends of runs where turning up into electrical equipment.

F. Unless otherwise noted on the Drawings, underground raceways systems shall be installed 30 inches below finished grade to top of raceways. Coordinate with other site utilities and run deeper, if necessary. Always run below gas lines.

G. Where trench depths are noted on the Drawings, depths shall be considered to mean buried depth to top of underground raceways.

H. PVC raceways, where not encased in concrete, shall snake from side to side of trench for expansion relief.

I. Underground raceway systems with manholes shall be installed with a minimum 3 inches per 100 foot slope to manhole for positive raceway drainage. Do not slope conduits toward building penetrations.

J. Where noted, concrete encased underground raceways in trenches shall have a 3 inch minimum concrete envelope between any raceway and edge of envelope.

K. Underground raceways installed below footings shall be concrete encased for full width and height of trench, extending 1 foot beyond each edge of footing.

L. Raceway envelopes shall be installed by monolithic pour method and vibrated in place to insure flow into voids and complete encasement of raceways. Raceways shall be bundled with twine on plastic spacers not over 5 feet on center and providing minimum conduit separation of 7 1/2 inches of center. Use steel reinforcing rods for alignment side stakes and support bottom of raceways on plastic base spacers not over 5 feet on center. Keep bottom of trench clean of debris and water. Envelope may be poured with side forms or "neat" excavated trench walls. Reinforce envelopes with rebar and wire ties.

M. Identification
   1. Location of underground raceways shall be identified with underground warning tape. Refer to Section 26 00 25, "Excavation, Backfill and Protection of Utilities" for warning tape requirements.

2. Concrete encased primary and secondary service raceway envelope shall be placed using colored concrete. Mix color pigment with the concrete at a rate of approximately 4.5 lbs. per sack of cement. In no case shall the pigment weight exceed 10% of the weight of cement.

N. Underground raceways run between equipment locations within the building shall be run within the confines of the building foundation walls.

O. Raceways installed for parallel feeder conductors shall be installed so that each run is the same length as the others.

P. Raceways shall not be run in same trenches with underfloor plumbing. Where crossing, conduits shall be run before piping.

END OF SECTION

SECTION 26 05 48
VIBRATION ISOLATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install complete vibration control devices as specified herein. Provide all accessories and equipment as necessary for a complete system.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets of all components

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

A. Vibration Isolation
   1. Amber/Booth Company, Inc.
   2. Korfund Dynamics
   3. Kinetics Noise Control, Inc.
   4. Vibration Mountings and Control

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION MOUNT TYPES

A. Type DNP (Double Neoprene Pads)
   1. Neoprene pad isolators shall be formed by two layers of 1/4 inch to 5/16 inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. These layers shall be permanently adhered together. The pads shall be sized so that they will be loaded within the Manufacturer's recommended range.
   2. Type DNP isolators shall be formed from one of the following products or approved equal:
      Type NR .....Amber/Booth
      Type Korpad .....Korfund Dynamics
      Type NPS.....Peabody Noise Control
      Series Shear Flex .....Vibration Mountings and Control

B. Type HN (Hanger Neoprene or Glass Fiber)
1. Vibration isolation hangers shall consist of a neoprene-in-shear or glass fiber element contained in a steel housing. A neoprene neck bushing (or other element) shall be provided where the hanger rods passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30 degree arc before contacting the hanger housing.
2. Type HN isolators shall be one of the following products of approved equal:
Type BRD-A.....Amber/Booth
Type H .....Korfund Dynamics
Type RH or FH .....Peabody Noise Control
Type RHD or RFD .....Vibration Mountings and Control

2.02 FLEXIBLE ELECTRICAL CONNECTIONS

A. Type A
1. Flexible electrical connection Type A shall be a prefabricated unit incorporating a flexible and watertight outer jacket, grounding strap, plastic inner sleeve to maintain smooth wire way, and end hubs with tapered electrical threads to fit standard threaded rigid metal conduit.
2. Flexible electrical connection Type A shall be Crouse-Hinds (Syracuse, NY) "XD" Expansion/Deflection Coupling.

B. Type B
1. Flexible electrical connection Type B shall be field fabricated using a minimum 2 foot length of flexible conduit or cable.

C. Type C
1. Flexible electrical connection Type C shall be field fabricated using a minimum 4 foot length of flexible conduit or cable.

PART 3 EXECUTION

3.01 APPLICATION

A. Transformers
1. Transformers within the building construction shall be mounted on Type DNP isolators. Where the transformer is a part of a unit substation and the transformer cabinet is directly connected to switchgear cabinets, the entire unit substation assembly shall be mounted on Type DNP isolators. If the transformers are suspended, use Type HN isolators selected to achieve not less than 0.1 inch static deflection.
2. Electrical connections to isolated transformers, and unit substations shall be made using flexible electrical connections Type A or Type B.

B. Dimmer Cabinets
1. Dimmer cabinets shall be mounted on Type DNP isolators.
2. Electrical connections to dimmers shall be made using flexible electrical connections Type A or Type B.

C. Mechanical Equipment
   1. Electrical connections to vibration isolated mechanical equipment shall be made using flexible electrical connections Type A or Type C.

3.02 INSTALLATION

A. Coordinate the size, location, and special requirements of vibration isolation equipment and systems with other trades. Coordinate plan dimensions with size of housekeeping pads.

B. Provide vibration isolators of the appropriate sizes and proper loading to meet the specified requirements.

C. Supply and install any incidental materials needed to meet the requirements stated.

D. Should any electrical equipment cause excessive noise or vibration, the Contractor shall be responsible for remedial work required to reduce noise and vibration levels. Excessive is defined as exceeding the Manufacturer's Specifications for the unit in question.

E. In all cases, isolated electrical equipment shall be positioned so that it is freestanding and does not come in rigid contact with the building structure or other systems.

F. Isolation Mounts
   1. All mounts shall be aligned squarely above or below mounting points for the supported equipment.
   2. If a housekeeping pad is provided, the isolator shall bear on the housekeeping pad and the isolator base plate shall rest entirely on the pad.
   3. Hanger rods for vibration isolated support shall be connected to structural beams or joist, not to the floor slab between beams and joists. Provide suitable intermediate support members as necessary.
   4. Vibration isolation hanger elements shall be positioned as high as possible in the hanger rod assembly, but not in contact with the building structure, and so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting any object.

G. Flexible Electrical Connections
   1. Type C connections shall be installed in a grossly slack "U" shape or a 360 degree loop.
   2. Rigid conduit on the isolated-equipment side of the flexible connection, and the flexible connection itself, shall not be tied to the building construction or other rigid structures.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.01 NAME PLATES

A. Furnish and install equipment identification nameplates on all pieces of electrical equipment including, but not limited to:
   1. Safety Switches
   2. Motor Starters
   3. Panelboards
   4. Lighting Contactors
   5. Relays
   6. Each Switch, Circuit Breaker, Spare, and Space in Distribution Panelboards.

      Identify and label all existing circuits and equipment that are located within the contract construction area.

B. Nameplates shall state the equipment name and number or letter as shown on the Drawings; voltage and phase; HP, ampacity or KW size; and source of power. Identification shall be as shown in the following examples:
   1. Main Switchboard MSB
      480/277 V, 3Ø, 4W
      2500 Amps
      Fed by Utility Transformer
   2. Exhaust Fan EF1
      2 HP, 208 V, 3Ø
      Fed by Ckt P1-1
   3. Panel P1
      208/120 V, 3Ø, 4W
      225 Amps
      Fed by TFMR T1 – (Ckt H1-1)
   4. Electric Water Heater EWH-1
      4 KW, 208 V, 3Ø
      Fed by Ckt P1-7

C. In manholes, handholes, pull and junction boxes, identify each set of circuit conductors by permanent ink on plastic tags with circuit number, voltage and phase, wire size, source, and load information.

D. Refer to Section 26 00 80, “Power System Coordination Analysis” for equipment labeling. Arc Flash and Available Fault Current shall be provided for the following equipment:
   1. Panelboards
   2. Circuit Breaker Enclosures
   3. Plug-In Devices on Busways
   4. Elevator Controllers

E. Refer to Section 26 05 10, "Wire and Cable" for color code identification of wire and cable.

F. Refer to Section 26 24 20, "Panelboards" for branch circuit identification.

G. Refer to Section 27 10 00, "Structured Cabling System" for identification of communication wiring system cable and equipment.

1.02 SPECIAL INSTRUCTION AND WARNING SIGNS

A. Furnish and install nameplates giving warning as follows:
1. Non-load break disconnect switches and switches on the load side of variable frequency drives, shall have "Caution" warning sign stating "Do Not Open Under Load."
2. Series rated circuit breakers and/or fuses shall be identified as such as follows: "CAUTION - SERIES RATED SYSTEM - AMPS AVAILABLE. IDENTIFIED REPLACEMENT COMPONENT REQUIRED."

1.03 JUNCTION BOX IDENTIFICATION

A. Junction boxes in conduit runs shall be color coded and labeled as to the system that they have within. Each system shall have a different color or labeling scheme used. Do not color code in finished areas without ceilings.

B. Electrical power and lighting branch circuit junction boxes shall be painted, but labeled with the circuit numbers contained within. Labeling may be done with paint stencils or permanent black felt-tip markers.

C. Special systems shall have junction boxes painted as follows:
1. Fire Alarm - Red
2. Paging/Sound/Intercom - Blue
3. Card Access/Security - Yellow
4. Voice/Data/Video - White
5. Normal – Silver
6. Lighting – Black

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Nameplates for equipment shall be Safe-T-Mark Style matte non-glare finish with engraving depth no less than 0.003”. Provide nameplate suitable for outdoor use for equipment installed outdoors. Letter type shall be minimum 3/8 inch high for equipment name and 1/4 inch high for details. All uppercase letters.

B. Nameplates for wiring device cover plates shall be laminated adhesive plastic tape minimum of 1/4 inch high and all uppercase letters.

C. Color of nameplates shall be white with black letters for normal power systems and red with white letters for emergency power systems.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install nameplates on equipment using cadmium plated, steel, self-tapping screws or rivets.

B. Nameplates shall be installed on the front cover or trim of each piece of equipment. Where not possible, install on wall next to equipment using hollow-wall anchors.

C. Horsepower, ampacity, or kilowatt values shall be taken from the equipment as delivered in the field, not from the Drawings.

D. Wiring device cover plate nameplates shall be installed at top of cover plate.

3.02 EXISTING EQUIPMENT IDENTIFICATION

A. Provide nameplates on all existing equipment within building as listed in Paragraph 1.01.A. of this Specification Section.

B. Provide updated panelboard directories in all existing panelboards within building as required for new panelboards per Section 26 24 20, "Panelboards," Paragraph 3.01.

END OF SECTION

SECTION 26 05 82
UNDERGROUND JUNCTION BOXES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install underground junction boxes where required and/or as shown on the Drawings and specified herein. Boxes shall be provided where required to avoid an excessive number of bends and to facilitate wire pulling. Maximum distance between pull boxes shall not exceed 500 feet. Provide all accessories and equipment as necessary for a complete system.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets of all components

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

A. Underground pull boxes
   1. Quazite Composolite
   2. Norwalk
   3. Synertech Products Inc.

PART 2 PRODUCTS

2.01 UNDERGROUND JUNCTION BOXES

A. Underground junction boxes shall be constructed of gray polymer concrete and reinforced by heavy-weave fiberglass. Pull box rating shall be 8,000 lbs. over a 10" x 10" area designed for vehicular traffic.

B. Junction boxes shall be 17" x 30" x 16" deep with tapered flanged footing, open bottom, stackable construction, with two (2) 4-inch mouse holes. Covers shall be flush mounted, with skid resistant surface, pentahead bolts, and "Electric" or “Communications” logo as appropriate.

C. Junction boxes shall be Quazite PT 1730 BB.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install junction boxes where required and/or shown on the Drawings. Box covers shall be flush with surrounding soil.

B. Install junction boxes on a gravel base that extends down to bottom of conduit excavation.

END OF SECTION

SECTION 26 07 10
VOICE/DATA SYSTEMS RACEWAY

PART 1 GENERAL

1.01 DESCRIPTION

A. Division 26 Contractor shall furnish and install outlet boxes, conduits, raceways, risers, service lateral conduits and backboards for voice/data systems raceways.

B. Conduit stub-ups shall be provided in rooms with lay-in acoustic tile ceilings. In all other rooms, provide continuous conduit runs to nearest lay-in ceiling in corridors or directly to telecom rooms.

PART 2 PRODUCTS

2.01 OUTLET BOXES AND PLATES

A. Refer to Section 26 05 35, "Low Voltage Outlet Boxes".

2.02 CONDUITS

A. Conduits from voice/data outlet boxes shall be minimum 1 inch.

B. Conduits and conduit sleeves run between voice/data terminal closets shall be 4 inches.

C. Conduits run underground as service lateral raceway shall be 4 inches.

D. Refer to Section 26 05 43, "Underground Raceways" and Section 26 05 33, "Conduit and Fittings."

2.03 PULL BOXES

A. Pull boxes shall be of the following minimum dimensions for conduit sizes as shown:
1. 1 inch conduit – 6" W x 12" L x 3" D
2. 1 1/4 inch conduit – 12" W x 12" L x 4" D
3. 3 inch conduit – 24" W x 24" L x 5" D
4. 4 inch conduit – 12" W x 48" L x 6" D

B. Pull boxes shall be galvanized or baked enamel steel with screw covers.

2.04 VOICE/DATA WALL FIELD BOARDS

A. Service lateral conduits and riser conduits and sleeves shall terminate onto plywood voice/data wall field boards. Boards shall be of 4 feet by 8 feet by 3/4 inch fire retardant plywood mounted vertically in room with bottom at 8 inches AFF. Plywood shall be AC grade or better and void-free with Grade A surface exposed.

2.05 WALL SLEEVES

A. Provide sleeve through walls from corridor into rooms where wall goes up to deck above.

B. EZ-Path “Smoke and Acoustic Reclosable Cable Pathway”

2.06 ROOF SLEEVE

A. Provide appropriate weather tight roof penetration sleeve for Emergency Responder Radio Repeater System cabling to roof mounted antennas.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide a minimum of two 4 inch conduits as service lateral raceways underground from communication service provider point to main telecom room in building.

B. Provide a minimum of two 4 inch conduits or conduit sleeves between voice/data telecom rooms.

C. Provide a minimum of two 4 inch conduits from each voice/data telecom room to above ceiling of main corridor or to cable tray system.

D. Provide conduit stub-ups from each outlet location to above accessible ceiling space. Provide continuous conduits across exposed areas or areas of inaccessible ceilings. Provide conduits between isolated areas of accessible ceilings to provide a continuous pathway for wiring from main equipment location to each device. Floor outlets in slab on grade shall have conduits run up nearest column or wall to above accessible ceiling. Poke through type outlets shall have conduits run to above ceiling of main corridor on the floor below.

E. All conduit elbows shall have the following minimum bend radius:
1. 1 inch conduit - 9 inches
2. 1 1/4 inch conduit - 12 inches
3. 1 1/2 inch conduit - 15 inches
4. 2 inch conduit - 18 inches
5. 3 inch conduit - 36 inches
6. 4 inch conduit - 48 inches

F. Conduits for outlets shown exterior to the building shall be continuous from the outlet box back to the telecommunications room for the use of exterior rated cable.

G. All conduits shall have a pull cord installed.

H. Restore all fire ratings of walls, floors, and ceilings penetrated by conduits.

I. Provide a pull box in each conduit run that exceeds 100 feet in length. All pull boxes shall have straight through conduit entrance and exit. Pull boxes shall be installed in accessible locations.

J. Conduit runs shall have a maximum of two 90 degree bends.

K. Provide a blank coverplate on all outlet boxes without completed devices.

L. Telecom rooms have been located such that all outlets shall have a maximum of 90 meters of cable length. Install outlet conduits in the shortest manner possible to avoid exceeding this cable length.

END OF SECTION

SECTION 26 07 11
AUDIO/VIDEO SYSTEMS RACEWAY

PART 1 GENERAL

1.01 DESCRIPTION

A. Division 26 Contractor shall furnish and install outlet boxes, conduits, and raceways for audio/video systems.

B. Conduit stub-ups shall be provided in rooms with lay-in acoustic tile ceilings. In all other rooms, provide continuous conduit runs to cable tray in nearest lay-in ceiling in corridors or directly to telecom rooms.

PART 2 PRODUCTS

2.01 OUTLET BOXES AND PLATES

A. Refer to Section 26 05 35, "Low Voltage Outlet Boxes".

2.02 CONDUITS

A. Conduits from outlet boxes shall be 1 1/4 inch for video cabling.

B. Separate conduits shall be run for loudspeaker cabling, line level and communication cabling, microphone level cabling, control and data cabling, and RF cabling to provide signal separation and prevent noise and cross talk.

C. Conduits used only for loudspeaker cabling, line level and communication cabling, microphone level cabling, control and data cabling, and RF cabling shall be minimum 3/4 inch.

D. Refer to Section 26 05 33, "Conduit and Fittings."

2.03 PULL BOXES

A. Pull boxes shall be of the following minimum dimensions for conduit sizes as shown:
1. 3/4 inch conduit - 4" W x 12" L x 3" D
2. 1 inch conduit - 6" W x 12" L x 3" D
3. 1 1/4 inch conduit - 12" W x 12" L x 4" D
4. 3 inch conduit - 24" W x 24" L x 5" D
5. 4 inch conduit - 12" W x 48" L x 6" D

B. Pull boxes shall be galvanized or baked enamel steel with screw covers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Division 26 Contractor shall provide conduit stub-ups from each outlet location to above accessible ceiling space. Provide continuous conduits across exposed areas or areas of inaccessible ceilings. Provide conduits between isolated areas of accessible ceilings to provide a continuous pathway for wiring from main equipment location to each outlet. Floor outlets in slab on grade shall have conduits run up nearest column or wall to above accessible ceiling. Poke through type outlets shall have conduits run to above ceiling of main corridor on the floor below.

B. All conduit elbows shall have the following minimum bend radius:
1. 3/4 inch conduit - 5 inches
2. 1 inch conduit - 9 inches
3. 1 1/4 inch conduit - 12 inches
4. 1 1/2 inch conduit - 15 inches
5. 2 inch conduit - 18 inches
6. 3 inch conduit - 36 inches
7. 4 inch conduit - 48 inches

C. All conduits shall have a pull cord installed.

D. Restore all fire ratings of walls, floors, and ceilings penetrated by conduits.

E. Provide a pull box in each conduit run that exceeds 100 feet in length. All pull boxes shall have straight through conduit entrance and exit. Pull boxes shall be installed in accessible locations.

F. Conduit runs shall have a maximum of two 90 degree bends.

G. Provide a blank coverplate on all outlet boxes without completed devices.

END OF SECTION

SECTION 26 07 12
SECURITY SYSTEM RACEWAYS

PART 1 GENERAL

1.01 DESCRIPTION

A. Division 26 Contractor shall furnish and install outlet boxes, conduits, and raceways for security systems.

B. Conduit stub-ups shall be provided in rooms with lay-in acoustic tile ceilings. In all other rooms, provide continuous conduit runs to nearest lay-in ceiling in corridors or directly to telecom rooms.

PART 2 PRODUCTS

2.01 OUTLET BOXES AND PLATES

A. Refer to Section 26 05 35, "Low Voltage Outlet Boxes".

2.02 CONDUITS

A. Conduits from outlet boxes shall be minimum 3/4 inch.

B. Refer to Section 26 05 33, "Conduit and Fittings."

2.03 PULL BOXES

A. Pull boxes shall be of the following minimum dimensions for conduit sizes as shown:
1. 3/4 inch conduit - 4" W x 12" L x 3" D
2. 1 inch conduit – 6" W x 12" L x 3" D
3. 1 1/4 inch conduit – 12" W x 12" L x 4" D

B. Pull boxes shall be of baked enamel steel with screw covers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Division 26 Contractor shall provide conduit stub-ups from each outlet location to above accessible ceiling space. Provide continuous conduits across exposed areas or areas of inaccessible ceilings. Provide conduits to between isolated areas of accessible ceilings to provide a continuous pathway for wiring from main equipment location to each outlet. Floor outlets in slab on grade shall have conduits run up nearest column or wall to above accessible ceiling. Poke-through type outlets shall have conduits run to above ceiling of main corridor on the floor below.

B. All conduit elbows shall have the following minimum bend radius:
   1. 3/4 inch conduit - 5 inches
   2. 1 inch conduit - 9 inches
   3. 1 1/4 inch conduit - 12 inches
   4. 1 1/2 inch conduit - 15 inches
   5. 2 inch conduit - 18 inches

C. All conduits shall have a pull cord installed.

D. Restore all fire ratings of walls, floors, and ceilings penetrated by conduits.

E. Provide a pull box in each conduit run that exceeds 100 feet in length. All pull boxes shall have straight through conduit entrance and exit. Pull boxes shall be installed in accessible locations.

F. Conduit runs shall have a maximum of two 90 degree bends.

END OF SECTION

SECTION 26 08 40
ELECTRICAL TESTS, ADJUSTMENTS, INSPECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish equipment and perform as necessary all testing as required herein and called for in other Division 26 Specification Sections. Perform adjustments of equipment as required. Arrange for inspections by the authority having jurisdiction.

1.02 QUALITY ASSURANCE

A. Testing equipment shall be UL listed and specially manufactured and appropriate for the intended type of testing to be performed.

B. All testing shall be witnessed by Owner's Representatives. Provide five days advance notice.

1.03 SUBMITTALS

A. For Review:
1. Test results form (attached to the end of this Section) with all recorded data sheets and graphs

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Final Certificate of Inspection

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 TESTING

A. Amperage Phase Balance
1. Test and record amperage of each phase at main switchboard, each branch distribution panel, and all lighting and appliance panels.

B. Continuity of Conduit System
1. Test each run of metallic conduit for continuity of ground return path.

C. Conductor Insulation Leakage
1. Test each run of 600 volt cable for insulation leakage. Use the short-time method with readings taken at 30 and 60 seconds. Record results for conductors used for switchboard and panelboard feeders.
2. Test each run of 15 kV cable for insulation leakage. Refer to Section 26 05 13, "5-35 kV Cable" for test procedure. Record results of all conductors.

D. Grounding System Resistance
   1. Test and record grounding system resistance. Refer to Section 26 05 26, "Grounding" for test procedure.

E. Operating Voltage
   1. Measure and record operating voltage at main switchgear and all panelboards with all systems in building operating normally.

F. Dielectric Strength
   1. Provide megger test of all transformers to verify dielectric strength.
   2. No load/low load loss for medium voltage transformers.

3.02 ADJUSTMENTS

A. Amperage Phase Balance
   1. Where Contractor has deviated from panelboard circuit arrangement as shown on the Drawings, perform a phase balancing within the panelboard by rearranging the position of selected circuit breakers. Record the changed circuits on the "As-Built" Drawings.

B. Continuity of Conduit System
   1. Where the resistance of a conduit run is greater than two (2) ohms, disassemble all connections, clean, and reassemble to obtain an acceptable reading.

C. Conductor Insulation Leakage and Impedance
   1. Where insulation leakage is above Manufacturer's stated values, replace conductor.

D. Grounding System Resistance
   1. Refer to Section 26 05 26, "Grounding" for procedure for grounding system resistance adjustment.

E. Operating Voltage
   1. Adjust taps of all high voltage, service and dry-type transformers when loaded voltage readings drop below nominal system voltages. Final voltage shall be at nominal or above.

F. Other Adjustments
   1. Refer to Division 26 Specification Sections for additional adjustments.

3.03 INSPECTION

A. Inspection shall be performed by:
   1. Local authorized inspection agency, or
   2. State division of Inspection

B. Contractor shall arrange for periodic and final inspections in a timely manner and with due regard for the work of other Contractors and the Construction Schedule.

C. Include final Certificate of Inspection in the Record and Information Manuals.

END OF SECTION

TEST RESULTS FORM

PROJECT NAME:

CONTRACTOR:

SYSTEM:

SPECIFICATION SECTION NUMBER:

TYPE OF TEST:

EQUIPMENT USED:

WEATHER CONDITIONS:

TEMPERATURE:

HUMIDITY:

PART OF SYSTEM TESTED:

SUMMARY OF TEST:

PERSON PERFORMING TEST:_____ DATE: _____

CONTRACTOR'S REPRESENTATIVE:_____

(Attach Recorded Testing Data Sheets To This Form)

CERTIFICATE OF SYSTEM APPROVAL

PROJECT NAME:_____

CONTRACTOR:_____

SYSTEMS COMPONENT:_____

SPECIFICATION SECTION NUMBER:_____

A. APPROVAL (If required by specification section)

The above listed system has been inspected and approved as meeting the specified instructions for installation.

Owner's Representative:_____ Date:_____

B. EQUIPMENT DEMONSTRATION

The above listed system has been demonstrated to the following Owner's Representatives:

	NAME	TITLE	DATE	SIGNATURE
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

(ATTACH A SEPARATE PAGE FOR ADDITIONAL NAMES)

SECTION 26 09 26
LOW VOLTAGE LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. The intent of this set of specifications is to provide a complete, functional, intelligent, low-voltage lighting control system for the primary control of LED lighting sources, but also projection screens, motorized shades, and plug-load control.

B. Where shown on the drawings, the contractor shall furnish and install a complete low voltage lighting control system consisting of, but not limited to, relays, contactors, daylight sensors, and dimmers; controllers, enclosures, switch station, sensors, power supply, touch panel graphics stations, and miscellaneous components as required for a complete, operable lighting control system.

C. Where applicable standards have been established, all items of equipment, individual components and installation methods shall meet the requirements of these standards, including, but not limited to, Underwriter Laboratories (UL), the National Electrical Code (NEC), Federal Communications Commission (FCC) and any local or state codes that may be applicable.

D. Designated exit and emergency egress lighting as a part of this system shall be barriered from normal power circuits.

E. Listing of a manufacturer as acceptable does not in any way relieve the contractor from the responsibility for providing a lighting control system that meets all the requirements of these specifications.

F. All manufacturers shall submit to the specifying engineer a line-by-line compliance comparison between each specifications requirement and the system being proposed.

G. Any ambiguities in the drawings or specifications shall be brought to the attention of the specifying engineer for clarification.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Factory Assembly: All relays, contactors, controllers, enclosures, switch station and miscellaneous components shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and low-voltage control stations and/or network terminations. All connections shall be made to clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.

C. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.

D. NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.

E. NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

F. UL Approval: All applicable equipment shall be UL listed under section 916 / 508 and shall bear labels indicating compliance.

G. FCC Emissions: All applicable equipment shall comply with FCC emissions standards specified in Part 15, for commercial applications and shall bear labels indicating compliance testing. Equipment that does not meet these standards shall not be acceptable.

1.03 SUBMITTALS

A. For Review:
1. Specifications Compliance: Submit a line-by-line comparison that describes the differences between each specifications requirement and the equipment/systems being proposed. Comparison shall include a complete listing of how the proposed equipment/systems differ from that specified with regard to size, quantity, quality, method of control, features and functions, control software functions and installation requirements.
2. System Description: Supply as part of the submittal package a brief description of the lighting control system's major features and functions.
3. Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
4. Product Data Sheets: Provide as part of the submittal package detailed product data sheets for all major system components.
5. Riser Drawing: Provide as part of the submittal package a system riser drawing of sufficient detail to indicate relative placement of major system components and the required connections between each.
6. Programming schedules
7. Complete building plans showing all control devices, room controllers, dimmers, switches, panels, power supplies, photo sensors, occupancy sensors, etc.

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Certificate of System Completion

1.04 MANUFACTURERS

A. Low Voltage Control System
1. “nLight” by Acuity Controls
2. Watt Stopper
3. NX Control (Current) by Hubbell

4. Lutron
5. Leviton Lighting Management Systems

1.05 SYSTEM OPERATION

A. Lighting shall be controlled by switches, time-of-day function, occupancy and vacancy sensors, photo-sensors, and other devices.

B. All relay panels shall be connected together and function as one system.

PART 2 PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.

B. Lighting control zones consisting of one or more intelligent lighting control devices and shall be capable of normal powered, stand-alone operation of automatic control from sensors (occupancy and/or photocell) and manual control from local wallstations without requiring connection to a higher-level system backbone; this capability is referred to as “distributed intelligence.”
   1. Lighting control zones (wired and wireless) of at least 128 devices per zone shall be supported.

C. Networked intelligent lighting control devices shall have distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones shall operate according to their defined default settings and sequence of operations.

D. The system shall be capable of providing individually addressable switching and dimming control of networked luminaires, control zones, and relay and dimming outputs from distributed UL 924 power packs, or centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type.

E. Lighting control zones shall be capable of being networked with a higher level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software interface.

F. The system may include one or more primary controllers that provide time-based control and global system control across multiple control zones and backbone network segments. The primary controller also provides a means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP protocol.

G. The system shall include “bridge” devices that route communication from (wired zones) lighting control to and from the primary controller, for purposes of decreasing system wiring requirements.

H. All devices within the network including intelligent LED drivers shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.

I. System is required to connect to a standard computer network for communication to Internet enabled services remotely hosted by the luminaire and control vendor for the purpose of programming, monitoring and commissioning of BLE radio, VLC enabled LED drivers, support of lighting control and indoor positioning technology.

J. Wired Networked Control Zone Characteristics
   1. Connections to devices within a wired networked lighting control zone and to backbone components shall be with a single type of low voltage network cable, which shall be compliant with CAT5e specifications. To prevent wiring errors and provide cost savings, the use of mixed types of low voltage network cables shall not be permitted.
   2. Devices in an area shall be connected via a “daisy-chain” topology; requiring all individual networked devices to be connected back to a central component in a “hub-and-spoke” topology shall not be permitted, so as to reduce the total amount of network cable required for each control zone.
   3. System shall provide the option of having pre-terminated plenum rated CAT5e cabling supplied with hardware so as to reduce the opportunity for improper wiring and communication errors during system installation.
   4. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The “out of box” default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
   5. Once software is installed, system shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
   6. All networked devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.
   7. Networked control devices intended for egress and/or emergency light fixtures shall be provided that do not require the use of additional, externally mounted UL924 shunting and/or 0-10V disconnect devices, so as to provide a compliant sequence of operation for egress and/or emergency light fixtures while reducing the overall installation complexity and wiring costs of the system. The following types of networked control devices shall be provided for egress and/or emergency light fixtures:
      a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.

b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections to a normal circuit. Fixtures associated with these devices shall also contain a single band radio for wireless network communication and BLE beaconing.

2.02 SYSTEM INTEGRATION CAPABILITIES

A. The system shall be capable of interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols. The following system integration capabilities shall be available via BACnet/IP and BACnet/MSTP protocols:
   1. The system shall support control of individual devices, including, but not limited to, control of relay and dimming output. All system devices shall be available for control.
   2. The system shall support reading of individual device status information, including but not limited to, relay state, dimming output, power measurement, occupancy sensor stats, and photocell sensor states or readings. All system devices shall be available for polling for devices status.
   3. The system shall support activation of pre-defined system Global Profiles.
      a. The system shall support activation of Profiles (local or global) and Preset Scenes from third party systems by receiving dry contact closure output signals.

2.03 DEVICE SPECIFICATIONS

A. Wired Network system occupancy sensors
   1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
   2. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
   3. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
   4. Sensors shall be available in multiple lens options which are customized for specific applications.
   5. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
   6. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
   7. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
   8. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
   9. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
   10. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
   11. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.

12. Wall switch sensors shall have optional features for photocell/daylight override, and low temperature/high humidity operation.
13. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
14. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls.
15. Network system shall have sensors that can be embedded into luminaire such that only the lens shows on luminaire face.
16. Embedded sensors shall be capable of both PIR and Dual Technology occupancy detection
17. Embedded sensors shall have an optional photocell
18. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
19. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.

B. Wired Network system daylight (photocell and/or dimming) sensors
1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
4. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
5. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.

C. Wired Network System Power (Relay) Packs
1. Power Packs shall incorporate one Class 1 relay, a 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
3. All devices shall have two RJ-45 ports.
4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.

5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
7. Power Packs and Power Supplies shall be available that are WiFi enabled.
8. Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
9. Power Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
10. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
11. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
12. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
13. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
14. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
15. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
16. Power (Secondary) Packs shall be available that provide up to 20 Amps switching of general purposed receptacle (plug-load) control.

D. Wired Network System Relay & Dimming Panels
1. Panel shall incorporate up to 4 normally closed latching relays capable of switching 120/277 VAC or up to 2 Dual Phase relays capable of switching 208/240/480 VAC loads.
2. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
3. Panel shall provide one 0-10VDC dimming output paired with each relay.
4. Panel shall power itself from an integrated 120/277 VAC supply.
5. Panel shall be capable of operating as either two networked devices or as one.
6. Panel shall supply current limited low voltage power to other networked devices connected via CAT-5.
7. Panel shall provide auxiliary low voltage device power connected wired directly to a dedicated terminal connection.

E. Wired Network Auxiliary Input / Output (I/O) Devices
1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.
2. Devices shall have two RJ-45 ports
3. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
4. Specific I/O devices shall have a dimming control output that can control 0-10 VDC dimmable ballasts or LED drivers by sinking up to 20 mA of current.

5. Specific I/O devices shall have an input that reads a 0-10 VDC signal from an external device.
6. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event (toggle the lighting load) or run a local/remote control profile.
7. Specific I/O devices shall sense state of low voltage outdoor photocells.
8. Specific I/O devices shall enable RS-232 communication between lighting control system and Touch Screen based A/V control systems.
9. Specific I/O devices shall sense momentary and maintained contact closures, and either toggle a connected load after a momentary contact or ramp the load high/low during a maintained contact (stopping when the contact releases).

F. Wired Network System Wall Switches & Dimmers
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
2. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
3. All devices shall have two RJ-45 ports.
4. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
5. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
6. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
7. Devices with mechanical push-buttons shall be made available with custom button labeling
8. Devices with a single “on” button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.

G. Wired Network System Graphic Wall Station
1. Device shall have a 3.5” full color touch screen for selecting up to 16 programmable lighting control preset scenes or acting as up to 16 on/off/dim control switches.
2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
3. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
4. Device shall enable user supplied .jpg screen saver image to be uploaded.
5. Device shall surface mount to single-gang switch box.
6. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply.
7. Device shall have a micro-USB style connector for local computer connectivity.
8. Device shall have two RJ-45 ports for communication

H. Wired Network System Scene Controllers
1. Device shall have two, three, four, or eight buttons for selecting programmable lighting control profiles or acting as on/off switches.
2. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
3. Device shall recess into single-gang switch box and fit a standard GFI opening.
4. Devices shall provide LED user feedback.
5. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
6. All devices shall have two RJ-45 ports.

7. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
8. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
9. Device shall have LEDs indicating current selection.

I. Communication Bridges
1. Device shall surface mount to a standard 4" x 4" square junction box.
2. Device shall have 8 RJ-45 ports.
3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via a CAT-5 cabled connection.
5. Device shall be capable of redistributing power from its local supply and connect lighting control zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.

2.04 LIGHTING CONTROL PROFILES

A. Changes to the operation of the system shall be capable of being made in real-time or scheduled via lighting control profiles. These profiles are outlines of settings that direct how a collection of devices function for a defined time period.

B. Lighting control profiles shall be capable of being created and applied to a single device, zone of devices, or customized group of zones.

C. All relays and dimming outputs shall be capable of being scheduled to track or ignore information regarding occupancy, daylight, and local user switches via lighting control profiles.

D. Specific device parameters (e.g. sensor time delay and photocell set-point) shall be configurable via a lighting control profile.

E. All lighting control profiles shall be stored on the network control gateway device, with a system backup on the software's host server.

F. Lighting control profiles shall be capable of being scheduled to run according to the following calendar options: start date/hour/minute, end date/hour/minute, and sunrise/sunset +/- timed offsets.

G. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.

H. Daylight savings time adjustments shall be capable of being performed automatically, if desired.

I. Lighting control profile schedules shall be capable of being given the following recurrence settings: daily, weekday, weekend, weekly, monthly, and yearly.

J. Software shall provide a graphical tool for easily viewing scheduled lighting control profiles.

2.05 MANAGEMENT SOFTWARE

A. Every device parameter (e.g. sensor time delay and photocell set-point) shall be available and configurable remotely from the software

B. The following status monitoring information shall be made available from the software for all devices for which it is applicable: current occupancy status, current PIR Status, current Microphonics Status, remaining occupancy time delay(s), current photocell reading, current photocell inhibiting state, photocell transitions time remaining, current dim level, device temperature, and device relay state(s).

C. The following device identification information shall be made available from the software: model number, model description, serial number, manufacturing date code, custom label(s), and parent network device.

D. A printable network inventory report shall be available via the software.

E. A printable report detailing all system profiles shall be available via the software.

F. Software shall require all users to login with a User Name and Password.

G. Software shall provide at least three permission levels for users.

H. All sensitive stored information and privileged communication by the software shall be encrypted.

I. All device firmware and system software updates must be available for automatic download and installation via the internet.

J. Software shall be capable of managing systems interconnected via a WAN (wide area network)

2.06 GRAPHICAL NAVIGATION SOFTWARE

A. Software Graphics: Furnish one master copy of software optional floor plan graphic page(s) software, or accepted equal for the entire project which contains the following factory programming (Software shall be compatible with the latest version of Microsoft Windows®).:
   1. Full Device Option - A master graphic of the entire building, by floor, showing each control device installed in the project with zones outlined to include but not be limited to the following:
      a. Controls embedded light fixtures
      b. Controls devices not embedded in light fixtures
      c. Daylight Sensors
      d. Occupancy Sensors
      e. Wall Switches

f. Scene Controllers
g. Networked Relays
h. Bridges
i. Gateways
j. Panels
k. Device daisy-chain zone outlines

2. Zone Only Option - A master graphic of the entire building, by floor, showing only control zones:
   a. Zones outlined
3. Allow for pan and zoom commands so smaller areas can be displayed on a larger scale simply by panning and zooming each floor's master graphic.
4. A mouse click on any control device shall display the following information (as applicable):
   a. The device name.
   b. The device catalog number.
   c. The device configuration.
5. Installing contractor is responsible for documenting installation of control devices, including controls embedded fixtures.

PART 3 EXECUTION

3.01 INSTALLATION

A. Where shown on the drawings, the contractor shall furnish and install programmable lighting controllers of the quantities, sizes and types shown on the drawings or specified herein.

B. All equipment shall be installed in accordance with manufacturer requirements and in compliance with all applicable local and national codes and requirements.

C. Load circuit wiring shall be sized so that voltage drop shall not exceed 5% at socket of fixture farthest from the power source on any branch circuit.

D. Provide 120 volt power to relay panels from a separate 20 Ampere branch circuit.

E. Cat 5e low voltage control cabling shall be plenum rated. Cables shall be field tested after termination to verify integrity.

F. Install Cat 5e cables in a manner that minimizes potential damage from future access to ceiling spaces. Run cables vertically up from each device, to building structure above. Attach cables to building structure supported every 6 feet. Provide proper amount of cable slack at each device to moving of ceiling titles for access to the ceiling space.

3.02 TESTING

A. All Cat 5e shall be tested after termination, before connections to equipment.

B. Each device shall be tested to insure it is fully wired and functional before factory startup and programming is scheduled. Contractor is responsible for all additional costs for factory startup if the system is not ready when scheduled.

3.03 MANUFACTURER'S SERVICES

A. Factory Programming: All controllers shall be factory programmed in accordance with the project specifications prior to shipment. All required firmware and software shall be installed prior to final testing and shipment.

B. Installation Assistance: During the installation process, the manufacturer shall provide, at no cost, technical support via a toll-free telephone line to the installing contractor or owner's representative to answer questions and supply additional information when required.

C. System Start-Up: The system manufacturer shall provide a factory authorized field engineer to the project site after installation has been completed and prior to system energization for the purpose of testing and adjustment of the system. Factory field engineer shall test and verify all system functions and ensure proper operation of the system components in accordance with the specifications and on-site conditions. The installing contractor shall notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 2 weeks prior to scheduling a field engineer for start-up of the system. Should the field engineer arrive on the job site and find the installation incomplete, the installing contractor shall pay the cost of any future visits by the field engineer required to complete the system start-up.

D. On-Site Programming: During the start-up procedure, the factory field engineer shall provide programming assistance and guidance to the building operating personnel in order to program the systems for initial operation.

E. Instruction: During the start-up procedure, the factory field engineer shall provide training to the building operating personnel in the operation, programming and maintenance of the lighting control system.

F. As-Built Drawings: After completion of the system installation and testing, the manufacturer shall provide three sets of "as-built" drawings.

G. Operation and Maintenance Manuals: After completion of the system installation and testing, the manufacturer shall provide three sets of Operations and Maintenance Manuals.

3.04 SPARE PARTS

A. Furnish spare devices of a quantity of 10 percent of total used in building.

B. Obtain a signed Copy of the Certificate of Material Receipt in Section 26 00 99, "Requirements for Contract Completion."

3.05 EQUIPMENT DEMONSTRATION

A. Instruction shall include:
1. Location of all components of the system and explanation of their function.
2. Demonstration of equipment.
3. Maintenance and repair procedures.
4. Programming procedures.
5. Review of documents in Record and Information Manuals.

B. Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."

C. Training sessions shall be videotaped and delivered to Owner in DVD in MPEG 3 format.

END OF SECTION

SECTION 26 24 20
PANELBOARDS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install circuit breaker panelboards as indicated in the panelboard schedules and as shown on the Drawings.

B. Provide all circuit breaker devices and accessories as noted on the Drawings, herein specified, and as required.

C. Short circuit ratings shall be as shown on the Drawings. Equipment shall be fully rated; series ratings are not permitted.

D. Provide lug sizes as necessary for cable sizes as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Branch circuit breakers shall be UL listed as SWD (switching duty) for single pole 15 and 20 Ampere circuits.

C. Branch circuit breakers feeding HVAC equipment shall be "HACR" rated.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets of panelboards and devices
2. Schedules showing quantities, sizes, and arrangement of devices

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Accurate panelboard directories based on the schedules on the Drawings, but updated per as-built changes

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Panelboards
1. Square D Company
2. Eaton Corporation
3. Siemens Energy & Automation, Inc.
4. GE by ABB

PART 2 PRODUCTS

2.01 CIRCUIT BREAKER PANELBOARDS

A. Types
1. Panelboards shall be molded case circuit breaker type with dead front construction.
2. Panelboards for 208Y/120 volt, 3 phase, 4 wire service shall be Square D Type NQ with Type "QOB" bolt on thermal magnetic molded case circuit breakers, (maximum depth of 5 3/4 inches). 22,000 AIC minimum.

B. Boxes
1. Boxes shall be constructed of commercial, galvanized, code gauge sheet steel, surface or flush mounted as scheduled on the Drawings.
2. Boxes for panelboards shall be sized to provide code gutters but to have minimum width of 20 inches and a maximum depth of 5 3/4 inches.
3. Boxes for double tub panels shall be same size in height.
4. Boxes shall have sufficient wire bending space to accommodate conductor sizes as shown on the Drawings.
5. Panelboard enclosures shall not have any openings that would compromise Arc-Flash safety levels.
6. Rated for environmental conditions at installed location.
   a. Indoor dry and clean locations: NEMA 250, Type 1.
   b. Outdoor locations: NEMA 250, Type 3R.
   c. Kitchen and washdown areas: NEMA 250, stainless steel.
   d. Other wet or damp indoor locations: NEMA 250, Type 4.
   e. Indoor locations subject to dust, falling dirt, and dripping non-corrosive liquids: NEMA 250, Type 12.

C. Bussing
1. Bus bars shall be copper or tin-plated aluminum and arranged and drilled for sequence phasing.
2. Equipment ground bus shall be provided in each panelboard in addition to any neutral bus requirements. Bus to have same number, size, and type of anti-turn solderless lugs neutral assembly has. Ground bus to be factory bonded to panelboard tub.
3. Provide full size neutral bus with suitable lugs for each outgoing feeder requiring a neutral connection.
4. Provide through-feed lugs for all panelboards for future use.

D. Mains
1. Provide main breakers for panelboards of the type and class indicated on the Drawings. Panelboards without main breakers are to be provided with solderless type incoming lugs suitable for either copper or aluminum conductors sized to accommodate wiring as shown on the Drawings.

E. Arrangement
1. Panelboards shall have respective main and branch breakers including spares, provisions for future breakers and spaces arranged in accordance with panelboard schedule to facilitate field wiring and be in agreement with branch circuiting shown on the Drawings.

2. Panelboards equipped with multiple pole circuit breakers shall have circuit numbers based on single pole position. Multiple pole breakers and spaces shall be identified by top single pole position number of that breaker.

F. Branch Circuit Breakers
1. Thermal magnetic molded case circuit breakers with bolted bus connections.
2. Breakers shall have an over center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication.
3. Ground fault protection (GFP) type circuit breakers shall be rated for 30 milliamp trip setting, up to 60 Amperes/2 pole configuration at 22,000 AIC. GFP type circuit breakers shall be used for equipment protection only, interior and exterior to the building (snow/ice melting equipment, heat trace, or pool/pond pumping and lighting equipment).
4. Ground fault circuit interrupter (GFCI) type circuit breakers shall be rated for five milliamp trip setting, up to 50A, 120V and 100A, 208V, 3-pole configuration at 22,000 AIC. GFCI type circuit breakers shall be used for personnel protection interior and exterior.
5. Arc fault circuit interrupter (AFCI) type circuit breakers shall be combination type, 20 Amperes, 1-pole or 2-pole as shown on the Drawings with 22,000 AIC rating.
6. Branch circuits shall be connected for sequenced phasing, i.e., circuits No. 1 and 2 connected to Phase A; circuits No. 3 and 4 connected to Phase B; etc. to conform with the branch circuit numbering system on the Drawings. "Polarity" or "Block" phasing will not be acceptable.
7. Scheduled lock-on devices for certain branch circuits are to be furnished and installed which prevent manual operation of breaker handle but not impede trip-free capability of breaker.

G. Trims
1. Door and trim finish shall be Manufacturer's standard lacquer or enamel.
2. All trim shall be made for surface or flush mounted panelboards as scheduled on the Drawings and hinged to back box for "door in door" design. Doors shall be equipped with totally concealed hinges and trim clamps and flush chrome-plated combination locks and catches, all keyed alike. Fronts shall not be removable with door in the locked position.
3. Furnish two (2) keys for each panelboard installed and one (1) pint of touch-up enamel paint.
4. Panelboards located in kitchens shall be provided with stainless steel trims.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate location of panelboards with the work of other Contractors. Installation shall meet the requirements of NEC Article 110.26, NECA 1, and NEMA PB 1.1.

B. Securely install panelboards to the vertical finished or structural surface behind the panelboard.

C. Install panelboard cabinets (box) at a height such that highest circuit breaker does not exceed 6'-6" above floor.

D. Install surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

E. Furnish directory frames inside the door of each panel which shall contain a correct typewritten directory card, properly filled out to correspond to the circuit numbers on the Drawings and the room numbers of loads served. If room numbers assigned by the Owner do not match the room numbers on the Drawings, both sets of room numbers must be cross-referenced and identified in the panel directory.

F. All flush panelboards shall have a 3/4 inch spare conduit rising and turning out of the wall above the ceiling line for every three (3) spares and spaces in the panelboard.

G. Clean interior and exterior of equipment. Touch-up all scratched finishes. Vacuum out all debris in enclosure before energizing.

H. Provide nameplates in accordance with Section 26 05 53, "Electrical Identification."

I. Deliver keys and touch-up enamel to Owner's Representative. Refer to Section 26 00 99, "Requirements for Contract Completion."

J. Panelboards installed in garages shall be mounted so that bottom of cabinet is higher than 18 inches above floor, to be above NEC hazardous area.

K. Install panelboard cabinet plumb and rigid without distortion of box.

L. Install recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

M. Install filler plates in unused spaces.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

END OF SECTION

SECTION 26 24 22
DISTRIBUTION PANELBOARDS-CIRCUIT BREAKER TYPE

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install equipment as shown on the Drawings, where located, and with all required accessories.

B. Equipment shall be completely factory designed, constructed, assembled, and tested with all components in place.

C. Short circuit ratings shall be as shown on the Drawings. Equipment shall be fully rated; series ratings are not permitted.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Service entrance panelboards shall be UL labeled as “suitable for use as service entrance equipment” (SUSE).

C. Circuit breakers feeding HVAC equipment shall be "HACR" rated.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets on all components of panelboards
2. Dimensioned shop assembly Drawings.

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Distribution Panelboards
1. Siemens Energy & Automation, Inc.
2. Cutler-Hammer/Eaton Corporation
3. Square D Company
4. GE by ABB

PART 2 PRODUCTS

2.01 PANELBOARDS

A. Panelboard enclosure shall be dead front gray baked enamel steel with four (4) piece bolt on front panel with concealed self-adjusting trim clamps.

B. Panelboard interior shall have factory assembled copper or tin-plated aluminum bussing, fully rated with ampacity and short circuit-interrupting rating as noted on the Drawings. Interrupting rating shall apply to entire panelboard as a unit. Enclosure and bussing shall be full height (90 inches) or as tall as will fit into the space where shown on the Drawings.

C. Neutral bus shall be minimum 100% rated and ground bus shall be minimum 25% rated. Equipment ground bus shall be bonded to enclosure.

D. Provide cable lugs and wire bending space as required to match wiring as shown on the Drawings.

E. Bussing for overcurrent protective devices shall be in a group mounted front accessible only arrangement. Main overcurrent protective devices shall be mounted at the top of the bus. Backfed devices are not permitted.

F. Enclosures shall not have any openings that would compromise Arc-Flash safety levels.

G. Panel shall have hinged “door in door” design with key locked handle latch.

2.02 CIRCUIT BREAKERS

A. Refer to Section 26 28 19, "Circuit Breakers."

2.03 SPARE DEVICES

A. Provide the following spare overcurrent protection devices in ADDITION to those shown on the Drawings:
   1. Two (2) 30 Ampere, 3 pole circuit breakers
   2. Two (2) 100 Ampere, 3 pole circuit breakers

PART 3 EXECUTION

3.01 APPLICATION

A. Service entrance main circuit breakers shall have single phase protection and shall open when the voltage on any one phase leg drops below 70%.

3.02 INSTALLATION

A. Install panelboards at the locations shown on the Drawings. Top of panelboard shall be mounted a minimum of 6 feet above finished floor, but at height so that highest circuit breaker handle will not exceed 6 1/2 feet.

B. Install panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted support vertically.

C. Where bottom of panelboard would be less than 6 inches above finished floor, set panelboard on a nominal 4 inch concrete housekeeping pad. Limits of concrete pad shall exceed dimensions of panelboard by 3 inches on front and both sides.

D. Tighten connectors and terminals, including screws and bolts, in accordance with Equipment Manufacturer's published torque tightening values. Where values are not available, comply with torques specified in UL Standard 486A.

E. Clean exterior of equipment of dirt and smudges and dirt from interior compartments. Touch-up all scratched finishes. Vacuum out all debris in enclosure before energizing.

F. Provide nameplates for panelboard, circuit breakers, spares and spaces in accordance with Section 26 05 53, "Electrical Identification."

G. Install panelboard cabinet plumb and rigid without distortion of box.

H. Install filler plates in unused spaces.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES AND PLATES

PART 1 VGENERAL

1.01 DESCRIPTION

A. Furnish and install wiring devices and plates as specified herein and as shown on the Drawings.

B. Specialty switches and outlets required for auxiliary systems shall be specified under those Sections or as shown on the Drawings.

C. All devices shall be ganged together where shown grouped on the Drawings.

D. All normal power devices shall be the same color.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.
   1. Comply with NEMA WD 1 and NEMA WD 6.
   2. Comply with UL 498.

B. All wiring devices and plates shall be furnished by one of the Manufacturers listed. No mixing of Manufacturer's products shall be permitted unless otherwise noted herein or on the Drawings.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets for wiring devices and plates

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Wiring Devices (except dimmers) and Plates
   1. Cooper, Eaton
   2. Pass and Seymour, Legrand
   3. Hubbell
   4. Leviton

B. Dimmers and Plates
   1. Lutron
   2. Leviton

C. Cover Assemblies
   1. TayMac Corporation
   2. Intermatic Inc.
   3. Carlon Electrical Products

D. Occupancy Sensors
   1. Watt Stopper Inc., Legrand
   2. Leviton
   3. Sensorswitch, Acuity

E. Emergency Lighting Switch Bypass Device
   1. Bodine
   2. WattStopper
   3. LVS Controls, Inc.

PART 2 PRODUCTS

2.01 SWITCHES

A. Switches shall conform to NEMA Heavy Duty Standards and shall be Specification Grade, general use AC quiet type, 20 Ampere, 120-277 volt, back and side wired with white handles, unless noted otherwise.

B. Lock type switches shall be 20 Ampere, 120-277 volt, back and side wired Corbin lock type, with stainless steel flush plate. Furnish two (2) keys with each lock type switch. All locks shall be keyed alike.

C. Pilot light switches shall be Specification Grade, general use AC quiet type, 20 Ampere, 120-277 volt, back and side wired with clear handle.

D. Momentary contact switches shall be SPDT 2 circuit, 3 position, center "off," 20 Ampere, 120-277 volt, side wired with white handles.

E. Door jam switch shall be flush mounted, push button type switch.

2.02 DIMMERS

A. Wall Mounted LED Slide Dimmer Switches
   1. Wall dimmer switch shall be 120/277 volt operation for LED fixtures, decora style, slide dim levels from 0-100%, separate on/off push button switch; 0-10 volt dimming control wires for “sink” mode.
   2. Lutron Maestro

B. Wall Mounted LED Slide Dimmer/Vacancy Sensor
   1. Wall dimmer/vacancy sensor shall be same as 2.02A above, but have integral PIR sensor for light turn off after sensor time out.

2.03 RECEPTACLES

A. All convenience and power receptacles shall conform to NEMA Extra Heavy Duty Standards and shall be Specification Grade, grounding type.

B. Convenience duplex receptacles shall be 20 Ampere, 125 volt, back and side wired, 3 wire grounding, UL listed as complying with the requirements of NEC Article 250.146, NEMA 5-20R configuration.

C. Ground-fault circuit-interrupting (GFCI) duplex receptacles shall be 20 Ampere, 125 volt "feed-through" type, NEMA 5-20R configuration, self testing.

D. Isolated ground receptacles shall be the same as convenience receptacles, except a solid barrier of insulation insulates the receptacle grounding circuit from the mounting strap, and with an orange triangle on the lower face.

E. Tamper resistant duplex receptacles shall be 20 Ampere, 125 volt, 3 wire grounding, UL listed in accordance with NEC 406.12 and 210.52, NEMA 5-20R configuration.

F. Weatherproof Duplex Receptacles shall be 20 Ampere, 125 volt or 250 volt, UL listed as weather resistant type per NEC 406.

G. USB type duplex receptacles shall be the same as convenience receptacles, except with two 5 volt, 5amp USB outputs with one - type A and one type C USB port. USB power supply shall be minimum 3.1 Amps at 5 volts DC.

H. All receptacles shall be white, unless on emergency power, in which case receptacles shall be red.

I. Refer to the Drawings for specification of specialty receptacles.

2.04 PLATES

A. Plates for flush devices in interior partitions shall be smooth, nylon, 0.035 inch thick, satin finished, or type 304 stainless steel. Type 316 stainless steel shall be used in damp, humid, or wet locations.

B. Plates for flush devices on concrete block walls shall match others but be "Jumbo" plates.

C. Plates for voice/data communication boxes shall match wiring device plates in material, and be as specified in Section 27 10 00, "Structured Cabling System."

D. Plates for devices in surface fittings shall be cadmium plated steel surface covers. Covers shall fit without overlap and have round corners.

E. Plates for specialty receptacles required for auxiliary systems shall be satin stainless steel, furnished and specified with the device.

F. Plates for wiring devices in kitchen and food preparation areas shall be stainless steel.

G. Plates for future system outlets shall be blank plates matching device plates in quality and finish.

2.05 COVER ASSEMBLIES

A. Wiring devices in damp locations shall have hinged, gasketed cast aluminum coverplates of a color matching adjacent wall finish. Listed and labeled for use in damp locations.

B. Wiring devices subject to wet locations shall be provided with NEMA 3R cover assemblies UL listed for wet locations while in use. Cover assemblies shall use a vertically-lifting "canopy" to protect the wiring device(s). Cover assemblies shall be standard size, one (1) or two (2) gang as required with gaskets between the hinged cover and mounting plate/base to assure proper seal.

2.06 OCCUPANCY SENSORS

A. Ceiling mounted low voltage dual technology occupancy sensors shall contain both PIR and ultrasonic technologies, adjustable 15 second to 15 minute time delay, integrated adjustable light level sensor, adjustable sensitivities, LED indicator for both technologies, isolated relay, 24 VDC operable, 277 volt power pack, 1200 square feet - wide angle coverage. Watt Stopper DT-200L, white color. Provide minimum one (1) power pack for every room.

B. Wall mounted line voltage passive infrared occupancy sensor shall have adjustable 30 second to 30 minute time delay, manual off switches for bilevel lighting control, integrated adjustable light level sensor, adjustable sensitivity, LED indicator, 900 square feet - 180 degree coverage. Color shall be white.

C. Power packs shall be 277 volt primary with self contained transformer and 20 Ampere relay contacts. Watt Stopper A277-E.

2.07 EMERGENCY LIGHTING SWITCH BYPASS DEVICE

A. Switch bypass devices shall be used to bypass local control of designated life safety egress luminaires and permit fixture to operate upon a loss of local normal power to adjacent luminaires.

B. Device shall consist of a relay, test switch, normal and emergency power indicator lights, enclosure, and control circuitry.

C. Device shall be rated for 20 Amperes, 120 and 277 volts.

D. Devices shall meet UL924 and have a five year warranty.

E. Bodine GTD20.

PART 3 EXECUTION

3.01 APPLICATION

A. Provide outlets as noted on the Drawings and herein described.

B. Provide GFCI type outlets in all bathrooms, anywhere within 6 feet of sinks, lavatories, mop basins, and in all exterior locations.

C. Provide GFCI type outlets for all 120 volt devices located in kitchens and other food preparation rooms.

D. Provide weatherproof "in use" covers on weatherproof outlets.

E. Provide tamper resistant devices in all rooms and areas specified in NEC 406.12.

F. Provide 30 mA GFP device outlets for heat trace type or ice melting gutter heating tape.

3.02 INSTALLATION

A. Install wiring devices as indicated, in compliance with the Manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of wiring devices with other work, including painting, electrical box and wiring work, as necessary.

C. Install wiring devices only in electrical boxes, which are clean, free from excess building materials, dirt and debris.

D. All devices shall be connected to conductors using the side wiring terminal screw connections with conductor bend in a circle for maximum surface contact. Devices with voltages higher than 120 volt shall have two (2) layers of electrical tape applied over the exposed side terminals. Provide electrically continuous, tight grounding connections for wiring devices, as required by NEC Article 250.

E. Delay installation of wiring devices and wall plates until after painting work is completed. Wiring devices may be installed prior to painting where protective plastic covers are used. All wiring devices and covers shall be clean and free of paint upon completion of work.

F. Upon installation of wall plates and receptacles, advise other Contractors regarding proper and cautious use of convenience outlets. At time of Contract Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

G. Install matching device plates on all devices. Devices shown grouped on the Drawings shall be ganged together under one plate.

H. Ceiling mounted occupancy sensors shall not be installed within 3 feet of an HVAC diffuser. Provide lens shields as required to prevent nuisance operation of occupancy sensors. Locate or aim sensors so they sense all areas of the room, but not out the doorway.

I. Wiring devices shall be installed with grounding pin on top.

J. Provide permanently installed barriers between switches ganged in outlet boxes where the voltage between adjacent switches exceeds 300 volts.

K. Run neutral conductor to all devices controlling lighting loads, such as switches and dimmers.

L. Occupancy sensors to be initially set at 75% maximum sensitivity and 5 minute time delay. Locate all occupancy sensor power packs and slave packs above lay-in ceiling at room entry location.

M. All unused outlet boxes shall have blank coverplates installed.

N. Wiring from ground-fault circuit-interrupters shall not occupy the same raceways with wiring from non-ground-fault interrupting type devices.

O. Tamper resistant duplex receptacles shall have their coverplates attached with tamper proof screws.

P. Install engraved flush switch plates at all locations indicating function of switches for special applications and at every location where more than two switches are ganged together. Engraved switch plates shall have 1/8 inch black filled letters.

Q. Receptacle plates shall be labeled with permanent marker on the back with panelboard name and circuit number.

R. Receptacle plates shall be labeled on the front indicating panelboard name and circuit number as specified in Section 26 05 53, “Electrical Identification”.

S. Use a torque screwdriver when a torque is recommended or required by manufacturer.

T. When conductors are larger than No. 12 AWG are installed on 20A circuits, splice No. 12 AWG pigtails for device connections.

U. Tighten unused terminal screws on the device.

V. When installing into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

W. Device plates: do not use overused or extra deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

X. Install devices that are required to be accessible in accordance with the ADA standards for accessible design.

3.03 OCCUPANCY SENSOR OPERATION VERIFICATION

A. Contractor shall verify proper operation of every occupancy sensor in building at completion of project. Provide appropriate masking on sensor where line-of-site extends out of room and causes nuisance operation when room is vacant.

3.04 SPARE PARTS

A. Furnish spare occupancy sensors in a quantity of 5% of total (of each type) used in building (minimum of two (2) of each type).

B. Division 26 Contractor shall include in his/her bid an allowance for furnishing and installing five (5) additional occupancy sensors of each type (with average length of conduit and wire) at completion of the project as directed by the Architect. If all are not used, remaining value shall be credited to the Owner or turned over to the Owner as additional spares per Owner's discretion.

C. Two screwdrivers for any specialty fasteners used.

3.05 TESTING

A. Prior to energizing circuitry, test wiring devices for electrical continuity, short circuits, and proper polarity connections.

B. Verify that occupancy sensors are turning off lighting when spaces are unoccupied. Each sensor shall be tested for proper operation with HVAC system operational.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install 600 volt and 250 volt fuses as herein specified and sized as shown on the Drawings.

B. Provide all accessories as specified.

C. All fuses shall be provided by the same Manufacturer.

D. For fuses greater than 600 volts, refer to appropriate equipment Specification Section.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.
   1. Comply with NEMA FG1.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets of fuses and accessories
   2. Fuse curves and selectivity ratio charts

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal
   2. Certificate of Material Receipt

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Fuses
   1. Bussmann
   2. Littelfuse
   3. Mersen

PART 2 PRODUCTS

2.01 FUSES - 601 AMPERES AND ABOVE

A. Fuses shall be 600 volt, UL Class L, current limiting, 200,000 Ampere interrupting rating with minimum time delay of 4 seconds at 500 percent rating. Fuse terminals shall be silver-plated, and fuse links shall be silver.
   1. Bussmann KRP-C HI-CAP

2.02 FUSES - 600 AMPERES AND BELOW

A. Fuses shall be rated 600 volt for nominal 480 volt systems and 250 volt for nominal 240 or 208 volt systems. Fuses shall be UL Class RK, current limiting, 200,000 Ampere interrupting rating, dual element, with minimum time delay of 10 seconds at 500 percent rating.
   1. Bussmann LPN-RK (250 volt) or LPS-RK (600 volt)

B. Motor control circuits shall use 600 volt, UL Class CC, current limiting, 200,000 Ampere interrupting rating, single element, non-time delay fuses.
   1. Bussmann KTK-R

2.03 FUSE REDUCERS

A. Fuse reducers shall be Bussmann 200-R or 600-R Series.

2.04 SPARE FUSE CABINET

A. Spare fuse cabinet shall be heavy 0.080" gauge aluminum wall mountable cabinet with internal shelves, 30" x 24" x 12", locking handle with cylinder type lock.

B. Bussmann SFC

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fuses in all fusible devices with name and fuse size facing outward.

B. Install spare fuse cabinets in main electrical room. Provide a list of all spare fuse sizes, types and quantities on inside of door.

C. Install fuse reducers in equipment where required.

D. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

E. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

F. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

3.02 SPARE PARTS

A. Provide spare fuses in the following quantities:
   1. 601 Amperes and above - three (3) of each current rating
   2. 600 Amperes and below - 10% of quantity used (minimum three (3)) of each voltage and current rating and UL Class

B. Refer to Section 26 00 99, "Requirements for Contract Completion."

END OF SECTION

SECTION 26 28 16
SAFETY SWITCHES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install safety switches where shown on the Drawings, and where required including all accessories and mounting hardware.

B. Refer to Section 26 28 17, "Elevator Safety Switches" for safety switches used for elevator controllers.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.
   1. Comply with NEMA KS 1.
   2. Comply with UL 98.

1.03 SUBMITTALS

A. For Review:
   1. Product data sheets of safety switches

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Safety Switches
   1. Square D Company
   2. Cutler-Hammer Electric Corporation
   3. Siemens Energy & Automation, Inc.
   4. GE by ABB

B. AC manual toggle disconnect switch
   1. Leviton

C. Equipment shall be furnished by the Manufacturer supplying major components of the electrical distribution system.

PART 2 PRODUCTS

2.01 SAFETY SWITCHES - NON-FUSIBLE

A. Safety switches shall have heavy-duty, single-throw, quick-make, quick-break, visible knife blade operators mounted in hinged cover steel enclosure. Lugs shall be listed for 75 degrees C ampacity aluminum or copper wire.

B. Switches shall be clearly labeled for "ON" and "OFF" handle positions. Cover shall have defeatable safety interlock with handle to prevent inadvertent opening when in the "ON" position. Handle shall be pad lockable in the "OFF" position with at least three (3) padlocks.

C. Safety switches to be horsepower rated 600 volt AC.

D. Switches shall have ground lug kit and neutral when required.

E. Non fusible switches shall be series-rated with upstream devices in accordance with manufacturer’s application date.

2.02 SAFETY SWITCHES - FUSIBLE

A. Fusible safety switches shall be as specified in Paragraph 2.01 and with the following additional features:
1. Safety switches rated 600 Amperes and less shall have spring reinforced, plated fuse clips with rejection feature for Class R fuses.
2. Safety switches rated larger than 600 Amperes shall have provisions for Class L fuses.
3. Short circuit-interrupting rating shall be 200,000 Amperes RMS symmetrical.
4. Safety switches to be horsepower rated 240 volt AC for 208 or 240 volt usage, and 600 volt AC for 480 volt usage.

2.03 AC MANUAL TOGGLE DISCONNECT SWITCHES

A. Toggle disconnect switch shall be snap switch with copper mechanism, silver alloy contacts, 10,000 Ampere withstand rating, in a NEMA 1 enclosure. 1, 2, or 3 pole with amperages of 30 to 60 Amperes, as required for load connected.

PART 3 EXECUTION

3.01 APPLICATION

A. Provide the following NEMA rated enclosure types in these locations:
1. Interior, dry and clean locations: NEMA 250, Type 1.
2. Exterior locations: NEMA 250, Type 3R.
3. Kitchens and washdown areas: NEMA 250, Type 4.
4. Other wet or damp, interior locations: NEMA 250, Type 4.
5. Indoor locations subject to dust, falling dirt, and dripping noncorrosive liquids: NEMA 250, Type 4.
6. Hazardous areas indicated on drawings: NEMA 250, Type 7 or Type 9 as applicable.

B. Provide AC manual toggle disconnect switch in NEMA 1 enclosure for disconnecting means located at instantaneous electric water heaters.

3.02 INSTALLATION

A. Use flexible conduit to and from safety switches where vibration isolation is required.

B. Install safety switches securely to building structure. Install safety switches on freestanding metal framing system support where mounting to building structure is not feasible or where shown on the Drawings. Framing system shall be galvanized steel.

C. Safety switches located downstream of variable frequency drives shall have auxiliary control power interlock switch on handle. Run wiring to variable frequency drives.

D. Provide fuses sized in accordance with Equipment Manufacturer's data plate.

E. Provide nameplates in accordance with Section 26 05 53, "Electrical Identification."

F. Touch-up all scratches on enclosure after installation.

END OF SECTION

SECTION 26 28 19
CIRCUIT BREAKERS

PART 1 AGENERAL

1.01 DESCRIPTION

A. Furnish and install circuit breakers in switchboards, distribution panelboards, and separate enclosures for overcurrent protection for panelboards, transformers and equipment, as shown on the Drawings and specified herein. Provide all accessories as necessary.

B. Short circuit ratings shall be as shown on the Drawings.

C. Refer to Section 26 24 20, "Panelboards" for circuit breakers in panelboards.

D. Provide frame size of circuit breaker with lug size as required to accommodate feeder size as shown on the Drawings.

E. Provide frame size, plug size, and trip units as necessary to meet short circuit ratings, and to provide selective coordination (down to 0.01 seconds) on emergency power distribution systems.

F. All circuit breakers shall be fully rated for short circuit levels indicated. Series ratings are not permitted.

G. Circuit breakers 1,200 amperes and larger shall have an arc flash energy reduction maintenance switch on the front with local status indicator.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets for all circuit breakers and components
2. Wiring diagrams

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Test results
3. Manufacturer Representative's signed Certificate of Inspection and Approval

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Circuit Breakers
1. Siemens Energy & Automation, Inc.

2. Cutler-Hammer/Eaton Corporation
3. Square D Company
4. ABB

PART 2 PRODUCTS

2.01 MOLDED CASE CIRCUIT BREAKERS WITH THERMOMAGNETIC TRIP

A. Molded case circuit breakers shall be bolt-on type operated by a toggle type handle and shall have quick-make/quick-break over-center switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual ON and OFF positions.

B. Breakers must be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Arc extinction must be accomplished by means of arc chutes.

C. Molded case breakers shall be of the thermal magnetic standard type that provides inverse time delay overload and instantaneous short circuit protection by means of a thermal magnetic element.

D. Single phase circuit breakers shall be balanced among the three (3) phases.

E. All circuit breakers shall have an integral lock-out/tag-out means.

F. High magnetic withstand circuit breaker type shall utilize higher trip levels of 18 to 20 times the breaker handle rating.

2.02 MOLDED CASE CIRCUIT BREAKERS WITH SOLID STATE TRIP

A. Circuit protective devices shall be molded case type circuit breakers UL Listed for 80% continuous current with full function trip system. Frame/Sensor ampere ratings shall be as shown on the Drawings. The ampere rating shall be clearly marked on the front of the circuit breaker. Circuit breakers shall be of fixed construction.

B. Circuit breakers shall be constructed using glass-reinforced insulating material providing high dielectric strength. Current carrying components shall be completely isolated from the trip unit and accessory mounting area. Breakers shall have common tripping of all poles and shall be trip free. The breakers shall have quick-make/quick-break contacts with an over center toggle operating mechanism. All circuit breakers shall be equipped with electrical accessories as noted on the Drawings.

C. The integral electronic trip system shall be independent of any external power source and shall contain electronic components to measure and time the output from internal current sensors and initiate automatic tripping action. The continuous ampere rating of the circuit breaker shall be determined by the combination of the ampere rating switch position, and the frame/sensor size of the circuit breaker. The resulting ampere rating shall be clearly marked on the face of the circuit breaker. Provide a means to seal the trip unit adjustments to discourage unauthorized tampering to meet the requirements of NEC Article 240.6.

D. Provide the following time/current curve shaping adjustment to maximize system selective coordination. Each adjustment shall have discrete settings and shall be independent from all other adjustments:
1. Adjustable Long Time Ampere Rating and Delay
2. Adjustable Short Time Pickup and Delay (delay includes I^2t in and I^2t out)
3. Fixed Instantaneous Trip
4. Ground fault trip (where shown on one line diagram). Provide indication only on devices supplied by emergency power system.

E. Provide local visual trip indication for overload, short circuit occurrences. The trip system shall include a memory circuit to detect intermittent overcurrent conditions. Each circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. No disassembly of the circuit breaker is required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

F. All circuit breakers shall have an integral lock-out/tag-out means.

2.03 ENCLOSURES

A. Enclosures shall have padlocking provisions for locking circuit breakers in the "OFF" positions.

B. Enclosure types shall be as follows:
1. NEMA 1 - Gray baked enamel on galvanized steel.
2. NEMA 3R - Gray baked enamel on galvanized steel with drain holes, lockable door, securable in the open position.
3. NEMA 4 - Gray polyester powder coated steel with gasketed cover and shall contain no knockouts.
4. NEMA 4X - Stainless steel with gasketed cover and shall contain no knockouts.
5. NEMA 12 - Gray polyester powder coated steel with oil resistant gasketed cover and shall contain no knockouts.

C. Enclosures shall be flush mounted in gypsum board walls and surface mounted on concrete walls.

PART 3 EXECUTION

3.01 APPLICATION

A. 15 Ampere through 250 Ampere circuit breakers shall be molded case with thermomagnetic trip sensor and mechanism.

B. Circuit breakers 300 Ampere and above shall be molded case with solid state trip sensor and mechanism.

C. Provide the following NEMA rated enclosure types for single circuit breakers in these locations:
1. Interior, dry and clean locations: NEMA 250, Type 1.
2. Exterior locations: NEMA 250, Type 3R.
3. Kitchens and washdown areas: NEMA 250, Type 4.
4. Other wet or damp, interior locations: NEMA 250, Type 4.
5. Indoor locations subject to dust, falling dirt, and dripping non-corrosive liquids: NEMA 250, Type 12.
6. Hazardous areas indicated on drawings: NEMA 250, Type 7 or Type 9, as applicable.

D. Provide auxiliary contacts on circuit breakers used to feed elevator equipment.

3.02 INSTALLATION

A. Install circuit breakers in switchboards, distribution panelboards or enclosures as shown on the Drawings and in accordance with Manufacturer's written instructions.

B. Provide nameplates in accordance with Section 26 05 53, "Electrical Identification."

3.03 TESTING

A. Perform a complete functional test of all features of circuit breakers in accordance with Manufacturer's recommendations. Submit written documentation in Record and Information Manuals.

END OF SECTION

SECTION 26 29 13
MOTOR CONTROLLERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install motor starters and combination motor starter/disconnect switches as shown on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Motor starters shall be sized in accordance with NEMA Standards.

C. ANSI/NEMA ICS2- 2000 (R2005)

D. ANSI/UL 508/2018

E. ANSI/NEMA ICS 1-2000 (R2008)

1.03 SUBMITTALS

A. For Review:
1. Product data sheets
2. Wiring diagrams

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal

C. Fuses
1. Refer to Section 26 28 13, "Fuses."

1.04 MANUFACTURERS

Subject to compliance with requirements, provide products by one of the following:

A. Motor Controllers
1. Siemens Energy & Automation, Inc.
2. Cutler-Hammer/Eaton Corporation
3. Square D Company
4. Allen - Bradley Company, Inc.
5. GE by ABB

PART 2 PRODUCTS

2.01 FRACTIONAL HORSEPOWER MANUAL STARTERS

A. Fractional horsepower manual starters shall be toggle type quick-make/quick-break switch with double break silver alloy contacts, melting alloy type thermal overload relay, red pilot light, in flush or surface mounted with stainless steel coverplate and handle guard/lockoff.

2.02 MAGNETIC MOTOR STARTERS

A. Magnetic motor starters shall be across-the-line magnetic type with double break silver alloy contacts, molded coil and solid state type overload relay with phase loss protection. Starters shall have four (4) external field convertible auxiliary contacts. Refer to Sequence of Operation in Division 23 for type.

B. Starters shall be 3 pole, 3 phase with solid state overload relays, 3 position hand-off-auto (H-O-A) switch, reset button, oversized control power transformer (50 watts extra capacity) with primary and secondary fusing, and green pilot light in NEMA rated enclosure.

2.03 COMBINATION MOTOR STARTER/DISCONNECT SWITCHES

A. Combination motor starter/disconnect switches shall be across-the-line magnetic type with double break silver alloy contacts, molded coil, solid state overload relay with phase loss protection. Starters shall have four (4) external field convertible auxiliary contacts. Refer to Sequence of Operation in Division 23 for type.

B. Combination motor starter/disconnect switches shall be 3 pole, 3 phase with solid state overload relays, three position hand-off-auto (H-O-A) switch, reset button, oversized control power transformer (100 watts extra capacity) with primary and secondary fusing, and green pilot light in NEMA rated enclosure.

C. Combination motor starters shall have a visible blade disconnect switch with fuse blocks. The disconnect handle used on combination motor starters shall always be in control of the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "ON" or "OFF," and shall include a two (2) color handle grip, the black side visible in the "OFF" position indicating a safe condition and the red side visible in the "ON" position indicating an unsafe or danger condition.

PART 3 EXECUTION

3.01 INSTALLATION

A. Motor locations shown on the Drawings are approximate. Obtain exact location of motors from Contractor installing the motor driven equipment. DO NOT ROUGH-IN BY SCALING THE ELECTRICAL DRAWINGS.

B. Final connections to equipment shall be made using liquid-tight flexible steel conduit.

C. Install fabricated steel floor stands for mounting starters where loads are in the center of a room. Floor stands shall be metal framing system or 2 inch steel angle with galvanized finish.

D. Wall-mounted switches and motor starters shall be grouped together and installed on a 3/4 inch fire retardant plywood backboard.

E. Provide appropriate solid state overload relay sized to match each motor nameplate rating. Overload relay for motors with power factor correction shall be adjusted according to ammeter readings of motor circuit.

F. Provide fuses in all fuse holders in accordance with Section 26 28 13, "Fuses."

G. Provide the following NEMA rated enclosure types in these locations:
1. Interior - 1
2. Exterior - 3R
3. Kitchens - 4X

H. Provide nameplates in accordance with Section 26 05 53, "Electrical Identification."

I. Provide control wiring as shown and/or described on the Drawings.

END OF SECTION

SECTION 26 33 23
CENTRAL BATTERY INVERTER SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install a complete Central Battery Inverter System as shown on the Drawings and specified herein. Provide all accessories and equipment as necessary for a complete system.

B. System shall be an off line interruptible power supply of 10 kVA rating with 90 minute battery capacity. System shall have 120 volt input/output.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
1. Product Data Sheets of all Components
2. Battery Capacity Calculations
3. Test Results

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Test Results
3. Certificate of System Completion

1.04 MANUFACTURERS

A. Central Battery Inverter System
1. Siltron Illumination Inc.
2. Chloride
3. Computer Power, Inc.

1.05 SYSTEM OPERATION

A. Central Battery Inverter System shall be an automatic standby power supply with energy storage in batteries and an inverter circuit to generate AC line voltage power for lighting loads. Under normal conditions, system shall wait off-line charging the batteries. When voltage drops below 85% the system shall pickup the load. System shall retransfer to normal supply when voltage exceeds 90%.

PART 2 PRODUCTS

2.01 ELECTRONIC SYSTEM

A. The inverter shall be solid state, with redundant switching power transistors.

B. The battery charger shall have continuous trickle charge with timed boost (equalize) charge. LED mode lights shall indicate charger operation. Unit shall have automatic low battery voltage disconnect. Charger shall have a 24 hour recharge time to full battery system capacity.

C. System shall have main input and main output circuit breakers.

D. Cabinet shall be floor/wall mountable sheet metal with louvered key lockable doors.

E. System shall have a ±1% output frequency tolerance with 10% total harmonic distortion (THD). Transfer time to be 50 milliseconds.

2.02 INSTRUMENTATION

A. Electronic section shall contain LCD display with the following functions:
1. Input Voltage
2. Battery Current
3. Battery Voltage
4. Output Frequency
5. Output Current
6. Output Voltage

B. Charger shall have low/high battery voltage alarm with charger failure alarm.

C. Unit shall have a battery exerciser to simulate power failure for ten (10) minutes every thirty (30) days.

2.03 BATTERIES

A. Batteries shall be premium lead calcium, sealed, no out-gassing, no maintenance, with a 25 year expected life.

B. Battery cabinets shall be floor/wall mountable, sheet metal with battery shelves and louvered key lockable doors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Central Battery Inverter System as shown on the Drawings in accordance with Manufacturer's written instructions.

B. Central Battery Inverter System shall be set on a nominal 4 inch high concrete housekeeping pad and bolted to a wall.

C. All wiring to be in conduit separate from all other branch circuit wiring.

D. Provide start up service from Manufacturer.

3.02 TESTING

A. Provide a complete functional test of Central Battery Inverter Supply in accordance with Manufacturer's recommendation.

B. Operate system for a minimum of seven (7) consecutive days with no problem before claiming Contract Completion.

C. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

3.03 EQUIPMENT DEMONSTRATION

A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by Manufacturer's authorized field technician.

B. Instruction shall include:
1. Location of all components of the system and explanation of their function
2. Demonstration of equipment
3. Maintenance and repair procedures
4. Programming procedures
5. Review of documents in Record and Information Manuals

C. Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."

3.04 EXTENDED WARRANTY

A. Provide a five (5) year extended Parts and Labor Warranty on all electronics.

B. Provide a twenty (20) year prorated warranty on batteries.

END OF SECTION

SECTION 26 41 13
LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install a complete Lightning Protection System as specified herein. Provide all accessories and equipment as necessary for a complete system.

1.02 QUALITY ASSURANCE

A. Lightning Protection System shall be UL listed and labeled, and certified as a Master Label "C" System.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets of all components
2. Layout Drawings
3. Test Results

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Certificate of System Completion

1.04 MANUFACTURERS

A. Lightning Protection System
1. Maxwell Lightning Protection Systems
2. Heary Brothers Company
3. Thompson Lightning Protection Inc.
4. Union Lightning Protection Company
5. Harger Lightning Protection Company

1.05 SYSTEM OPERATION

A. Lightning Protection System shall protect entire building against damage from lightning strikes.

PART 2 PRODUCTS

2.01 LIGHTNING PROTECTION SYSTEM DEVICES

A. Air terminals shall be 12 inch high, 3/8 inch solid copper (1/2 inch for Class 2) with impalement protection. Attaching brackets shall have threaded stud for air terminal and bolted pressure type cable connector. The attaching brackets shall be suitable for mounting the air terminal in the location indicated on the Drawings. Use flat base for flat roof; use parapet base for parapet wall mounting; etc. All air terminal bases shall be cast copper with stainless steel bolt-pressure cable connectors. The air terminals should be spaced so as not to exceed 20 feet apart around the outside perimeter of the roof or the ridge and not 50 feet apart through the center of flat roof areas.

B. Roof mounted conductors and down conductors shall be stranded copper. Where splices are required between conductors, connector shall be bolted pressure type. Conductors shall consist of UL listed 32 strands of 17 gauge copper wire weighting 215 lbs. per 1,000 feet (28 strand/14 gauge copper/375 pounds per 1,000 feet - Class 2) and installed in accordance with the UL Code. A perimeter cable shall be installed around the entire main roof. Each perimeter cable shall be connected to at least two (2) down leads, providing a two-way path to ground from each air terminal. All center roof air terminals shall be interconnected with conductors to the outside perimeter cable. Conductors on the flat roof areas may be run exposed. Ground connections shall be made around the perimeter of each roof and to the main down conductor. Aluminum material shall be used where necessary.

C. Down Conductors: Concealed down conductors shall be installed in 1 inch Schedule 40 PVC conduit. Each perimeter roof cable shall be connected to at least two (2) down leads. The average distance between down leads shall not exceed 100 feet from upper roof to lower roof, or from roof to ground terminals.

D. Cable Connectors: All cable connectors shall be cast copper with screw-pressure type stainless steel bolts and nuts. Exothermic welds shall be used below grade.

E. Interconnection of Metals: All metal bodies within 6 feet of the conductor shall be bonded to the system with approved fittings and conductor. Connections between dissimilar metals shall be made with approved bimetallic connections.
   1. Bonding of all metallic objects and systems at roof levels and elsewhere on the structure shall be complete. Primary bonds for metal bodies of conductance shall be bonded with appropriate fittings and full-size conductor; and shall consist of, but not be limited to the following: roof exhaust fans, HVAC units with related piping ductwork, exhaust vents and any other roof piping systems, cooling towers, antenna mast for TV, radio or microwave, roof ladders, and metal plumbing stacks. Exterior architectural metal fascia and/or curtain walls or mullions, which extend the full height of the structure shall also be bonded, if not inherently bonded through the building frame.
   2. Metal bodies of inductance located within 6 feet of a conductor or object with secondary bonds, shall be bonded with secondary cable and fittings. Typical of these are: roof flashings, parapet coping caps, gravel guards, isolated metal building panels or siding, roof drains, downspouts, roof insulation vents and any other sizeable miscellaneous metals.

F. Grounding: Grounding terminals shall be located at the base of the structure. Ground connections shall be made around the perimeter of the structure and in no case shall average over 100 feet apart. Ground terminals shall be 3/4 inch in diameter and shall be driven to a minimum depth of 10 feet. One ground shall have connection to the water system where the water supply enters the building - in addition to artificial ground. In case of rock ledge or other conditions making it impossible to comply with the above, trenching or a copper ground plate will be permitted; providing it will meet the Underwriters' Laboratories, Inc. requirements. Ground rods shall be set not less than 3 feet nor more than 8 feet from the structure.

G. Concealed Conductors: All concealed conductors shall be installed in 1 inch Schedule 40 PVC conduit.

H. Fasteners: Conductor fasteners shall be an approved type of non-corrosive metal, as required to support conductors and shall be spaced not to exceed 3 foot centers. Masonry type cable fasteners spaced every 3 feet on masonry. Adhesive type cable fasteners spaced every 3 feet on flat roofs.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Lightning Protection System in accordance with Manufacturer's written instructions.

B. Installation shall have "A" label on each air terminal and "B" label at 10 feet along all main conductors. Completed installation as shown shall bear UL Master Label "C" as per UL Code 96A.

C. Air terminal attaching brackets shall be permanently and rigidly attached to the building structure. There shall be a ground connection for each down conductor. Ground connections shall be protected from mechanical injury. Down conductors between building and ground rod shall be installed a minimum of 2 feet below finished grade.

D. All services involving excavating, trenching, backfilling, tamping of ground for ground rods, test wells, and ground loops shall be provided.

E. Underwriters' Laboratories, Inc. Master Label shall be furnished as evidence that the installation has met with UL 96A requirements. Shop drawings in detail and catalog cuts shall be submitted for approval prior to installation of the system.

F. Install impalement hazard wiring signs on all doors leading to roof.

3.02 TESTING

A. The completed system shall be tested as required to measure the grounding resistance. If two (2) or more driven ground rods are used to reduce the resistance, the rods shall be spaced at least 10 feet apart. Results of the ground resistance testing shall be submitted for review.

B. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

END OF SECTION

SECTION 26 43 13
SURGE PROTECTION DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install Surge Protection Devices (SPD) units as shown on the Drawings and herein specified.

1.02 QUALITY ASSURANCE

A. Surge protection devices shall be UL Listed and labeled under UL 1449.

B. Surge protection devices shall be tested to ANSI C62.41 and C62.45 Standards.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets of all components
2. All operating parameters including UL 1449 voltage category
3. Test results

B. To be Included in Record and Information Manuals:
1. One (1) copy of each approved submittal

1.04 MANUFACTURERS

A. Surge Protection Devices
1. Cutler-Hammer (Clipper)
2. Siemens Sentron TPS
3. Square D Company
4. GE by ABB
5. Liebert (Vertiv Co.)

PART 2 PRODUCTS

2.01 SURGE PROTECTION DEVICES

A. Surge Protection Devices (SPD) units where shown within switchgear or panelboards shall be integral mounted in an enclosed compartment, separate from the internal busbars with a hinged lockable door and provided with disconnect means. Diagnostic lights shall be mounted in front door.

B. Units that are external to switchgear and panelboards shall be self-contained, wall mountable, solid-state devices in an NEMA 12, enameled steel enclosure with hinged door and locking handle.

C. Units shall consist of an engineered system to achieve suppression using one (1) or more of the following components:
   1. Doped selenium plates
   2. Metal Oxide Varisters (MOV) in enclosed replaceable modules
   3. Sillicon Avalanche Diodes (SAD) in enclosed replaceable modules

D. SPD unit components shall be arranged to operate bi-directionally, in parallel with the line, have sinewave tracking characteristics, and have seven (7) modes of protection as follows:
   1. Each Phase: Line to Neutral
   2. Each Phase: Line to Ground
   3. Neutral - Ground

E. SPD units shall be classified by UL with the following ratings:

	Maximum Clamping Voltage L-N	Maximum Clamping Voltage N-G
208/120 volt, 3 phase "WYE" units -	400 volt	400 volt
480/277 volt, 3 phase "WYE" units -	800 volt	800 volt

F. SPD units shall be capable of surviving the following surge current on a single impulse basis without performance degradation of more than 10%:

1. Located at Service Entrance switchgear	150,000 Amperes per mode (300,000 Amperes per phase)
2. Located at downstream panelboards	50,000 Amperes per mode (100,000 Amperes per phase)

G. Units shall have Form C summary output contacts for remote monitoring capability.

H. Units shall have integral noise filtering of the following minimum attenuation level: 100 KHz – 55dB.

I. Units shall have integral diagnostic indicating lights and individual MOV fusing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install surge protective devices in the following areas:
   1. At main switchboard
   2. At each emergency power panelboard

B. Units shall be installed as close as possible to the equipment being protected (preferably closed nippled). Conductors and conduit shall be run horizontally directly from electrical equipment to surge suppressor enclosure.

3.02 EQUIPMENT DEMONSTRATION

A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by Manufacturer's authorized field technician.

B. Instruction shall include:
1. Location of all components of the system and explanation of their function
2. Demonstration of equipment
3. Maintenance and repair procedures
4. Programming procedures
5. Review of documents in Record and Information Manuals

C. Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."

3.03 EXTENDED WARRANTY/SPARE PARTS

A. Provide a five (5) year Extended Warranty or a complete spare parts package in accordance with Manufacturer's standard arrangement.

END OF SECTION

SECTION 26 51 14
LUMINAIRES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install luminaires, LED modules, and drivers as herein specified and shown on the Drawings.

B. Luminaire Manufacturer and model numbers shall be as scheduled on the Drawings. Luminaires not bearing a letter symbol shall match adjacent luminaire in space.

C. All LED modules and drivers for a given luminaire type shall be by the same Manufacturer.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

1.03 SUBMITTALS

A. For Review:
   1. Luminaires
      a. Product data sheets for each fixture.
      b. Lamp product data sheets for each fixture.
      c. LED driver or power supply product data sheets for each fixture.
   2. Construction Drawings for custom luminaires

B. To be included in Record and Information Manuals:
   1. One (1) copy each of approved submittal
   2. Certificate of Material Receipt

1.04 MANUFACTURERS

A. Luminaires
   1. Refer to Luminaire Schedule on the Drawings.

B. LED/LED Module
   1. Nichia
   2. Osram/Sylvania Corporation
   3. Philips Lighting Company
   4. Cree
   5. Achriche
   6. Equal approved by Engineer

C. LED Driver
   1. Emergency
      a. Bodine Company
      b. Iota Engineering Company
      c. Chloride Systems

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Luminaires shall be as scheduled on the Drawings.

B. Recessed LED luminaires shall have integral thermal protection.

C. LED luminaire shall be rated for installation/ambient temperature from -40 degrees C to +40 degrees C.

D. LED luminaire shall be modular in design with the ability to replace individual components without having to replace the entire luminaire.

E. LED luminaire shall have a minimum CRI of 80.

2.02 LED/LED MODULE

A. Unless specifically indicated otherwise per the luminaire schedule, all LED lamp colors shall be 4000K.

B. LED/LED Module shall be rated for a minimum of 50,000 hours of life at 85% output (L85).

C. LED/LED Modules shall originate from a common manufactured batch source.

D. LED/LED Modules shall adhere to LED package manufacturer guidelines, certification programs, and test procedures for thermal management.

2.03 LED DRIVER

A. LED driver shall have a rated life of a minimum of 50,000 hours.

B. Driver shall be FCC Part 15 compliant, UL 8750.

C. Driver shall meet ANSI C62.41 category A surge protection standards up to and including 10kA/10kV.

D. Driver shall have a power factor greater than 0.90.

E. Emergency LED drivers shall be integral mounted, ninety (90) minute capacity, sealed maintenance free nickel cadmium battery and integral charger, operate at rated lumen output of fixture or next highest lumen output available providing no less than 50% of the standard lumen output, and have remote mountable charging indicator light and test switch. Led drivers shall feature a self-diagnostic circuit that automatically tests unit and reports failure with an audible and visual alarm. (Bodine BSL Series or equivalent)

2.04 LUMINAIRE ACCESSORIES

A. Luminaires located in mechanical and electrical rooms, shops, workrooms, and gymnasiums shall have appropriate guards provided with each luminaire.

B. Luminaires located in gypsum board (drywall) or plaster ceilings shall have appropriate plaster rings provided with each luminaire.

C. Luminaires provided by the Manufacturer with cords attached shall be coordinated by the Division 26 Contractor so that cord lengths are of appropriate lengths for each luminaire installation.

D. Luminaires shall be provided with all required mounting hardware for a complete installation.

E. Exterior luminaires shall be installed on concrete bases.

F. Exterior aluminum poles longer than 19 feet shall have internal vibration dampeners.

PART 3 EXECUTION

3.01 APPLICATION

A. LED dimming drivers shall be provided in luminaires as required to provide dimming as shown on the Drawings.

B. Each driver shall have a disconnecting means located within 24 inches of the driver.

3.02 INSTALLATION

A. Luminaires shall be securely mounted to elements of the building structure such that they will be square, plumb, and rigid, and will not fall or sag. Flush luminaires shall be furnished with installation provisions compatible with the suspended acoustical system furnished by the General Trades Contractor. This Contractor shall verify the actual suspension system to be used and make all adjustments in luminaire installation provisions.

B. All open type troffers shall be shipped from the Manufacturer with the louver enclosed in plastic wrap. The Contractor shall install the luminaires with the plastic wrap intact and only remove the wrap after the work environment is clean. Contractor shall patch any holes in the wrap to keep dirt out of the luminaire during construction.

C. All luminaires mounted in suspended acoustical tile ceilings shall be securely attached to the ceiling grid system by removable grid clips or fasteners. Recessed "can" type luminaires shall have bar hangers attached to the ceiling grid system.

D. All luminaires mounted on suspended acoustical tile ceilings shall be mounted to junction boxes with bar hangers attached to the ceiling grid system. In addition, luminaires heavier than ten (10) pounds shall have hangers attached to the ceiling grid system.

E. All luminaires that are wall mounted or surface mounted to other than suspended acoustical tile ceilings shall be attached to outlet boxes that are securely supported to the building structure and UL listed for luminaire support.

F. All surface mounted and recessed luminaires installed in suspended acoustical tile ceilings, shall have a supplemental support means attached to the building structure consisting of chain or cable, installed with 6 inches of slack. This support means shall be attached from the structure to the luminaire at each end and shall be capable of suspending the luminaire in the event the ceiling grid at the luminaire is removed.

G. Clean both inside and outside surfaces of luminaires after installation. No luminaires shall be installed until the painting work of the General Trades Contractor is completed. Damaged, deformed or defective luminaires are to be replaced.

H. All luminaires are to be in working order at the time of Contract Completion. This Contractor shall replace all defective LED components with new LED components up until the time of Contract Completion.

I. Prewired flush luminaire shall have minimum 90 Degree C wiring. Junction box capacity shall be sufficient for the circuit wiring requirements.

J. Furnish all required installation accessories for the luminaires as required for specific location whether or not included in the Manufacturer's catalog number. Such accessories include plaster frames, rings, flanges, canopies, stem hangers, and suspension straps. REFER TO ARCHITECTURAL ROOM TREATMENT SCHEDULE.

K. Designated night light, emergency egress, and exit signage luminaires shall be connected ahead of any switching.

L. Install emergency drivers integrally within the luminaire if possible; otherwise, remote mounted from the luminaire to building structure above ceiling. Install test switch/charging light plate in ceiling tile next to luminaire. Wet, outdoor, or hazardous location luminaires shall have their emergency drivers installed within the confines of the building in a heated non-hazardous area.

M. Luminaires provided by the Manufacturer with cords attached shall be coordinated by the Division 26 Contractor to assure adequate cord length for each individual luminaire installation.

N. Luminaire supports used in fire rated ceiling assemblies shall be in conformance with that assembly's UL listing requirements.

O. Install in-line fuse and fuse holders in all exterior luminaires on the line side of the driver. Install two (2) fuse holders or a double pole fuse holder on 208, 240, or 480 volt single phase circuits. Fuse holders shall be installed at a location convenient for changing fuses.

P. Install in-line fuse and fuse holders in all luminaires that are powered from the life safety branch, on the line side of the driver. Contractor shall verify fixture voltage and amperage.

Q. Coordinate exact wiring requirements to luminaire drivers with Manufacturer.

R. Flexible conduit or cord run down to suspended luminaires shall be installed along side of the suspension chain and neatly attached along its entire length.

S. Fixture whips shall be of a minimum size as specified in Section 26 05 10, "Wire and Cable" and Section 26 05 33, "Conduit and Fittings".

3.03 SPARE PARTS/ALLOWANCE

A. Division 26 Contractor shall include in his/her bid an allowance for furnishing and installing five (5) additional exit sign luminaires (with average length of conduit and wire) at completion of project as directed by the Architect. If not all used, remaining value shall be credited to Owner or turned over to Owner as additional spares per Owner's discretion.

B. Electrical contractor shall provide 5% (with a minimum of 5 drivers) of each type of LED driver specified as spare, sealed in original packaging and placed in the building storage as directed by Owner.

C. Electrical contractor shall provide 5% (with a minimum of 5 LED/LED modules) of each type of LED/LED module specified as spare, sealed in original packaging and placed in the Building storage as directed by the Owner.

3.04 WARRANTY

A. Luminaires and emergency drivers shall have a Manufacturer's full warranty for five (5) years.

B. LED boards shall not deviate beyond two (2) SDCM from initial color during warranty period, or manufacturer shall provide replacement boards at no cost.

END OF SECTION

SECTION 26 81 10
FIRE ALARM SYSTEM (SMALL)

PART 1 GENERAL

1.01 DESCRIPTION

A. Division 26 Contractor shall furnish and install all equipment and accessories for a complete local, manually and automatically actuated, electrically operated, device annunciated, double supervised, non-coded 24 VDC fire alarm system as described herein and as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. Fire alarm installation shall conform to the requirements of the NFPA 101, Life Safety Code, the Ohio Building Code, and Local Code and Building Authority requirements.

B. All equipment shall be UL listed and labeled, and in accordance with applicable NEMA and ANSI Standards and Codes:
1. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the U.S.
2. National Electrical Code (NFPA 70)
3. FCC Part 15, Subpart J
4. EMC Directive 89/336/EEC
5. NFPA 72

C. All devices and installation shall be in accordance with the Americans with Disabilities Act.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets of all components.
2. Riser/wiring diagrams and plans of entire system showing all devices, quantity and size of wires, conduit sizes, zone schedule, sound levels, types of audible devices.
3. Power supply, amplifier and battery calculations indicating operating time and spare capacity for additional devices.
4. Voltage drop calculations for strobe circuits.

B. To be included in Record and Information Manuals:
1. One (1) copy of each approval submittal
2. Certificate of Material Receipt
3. Certificate of System Completion

C. Submit shop Drawings to the appropriate Building Authority's office for review after approval by the Architect. These drawings shall include the following statement:

Korda/Nemeth Engineering, Inc., 1650 Watermark Drive, Suite 200, Columbus, Ohio 43215 as shown on the Construction Documents and as required by the OBC, designed the fire protective signaling system for this project. The [Insert Company Name] project Drawings are provided with Manufacturer's installation and wiring recommendations to assist in the installation. Korda/Nemeth Engineering, Inc., Job # _____.

[Insert Designer Name]
[Insert Company]
[Insert City, State]
NICET Level _____
Fire Protection System Designer
[Insert, Name]
[Certification # _____, valid through _____]

1.04 MANUFACTURERS

A. Fire alarm system components shall be as manufactured and/or certified by Manufacturer to work as a complete and functional system.
1. Notifier
2. Edwards System Technology
3. Simplex-Grinnell
4. Siemens Fire Safety
5. Autocall

1.05 SYSTEM OPERATION

A. Operation of any manual pull station or the actuation of any automatic device shall cause immediate and continuous operation of fire alarm signal and alarm indication at the control panel and remote annunciators until the actuated device is restored to normal and the control panel is manually reset.

B. Fire alarm control panel shall send a signal to the remote monitoring service organization via leased telephone lines to indicate alarm or trouble condition.

C. The remote annunciator panel shall audibly and visually annunciate both alarm and trouble as well as visually indicate the affected device.

D. In the event of operating power failure, an open, or grounded circuit in the system, a trouble signal and trouble lamp shall be activated until the system is restored to normal. The trouble signal may be silenced by means of a switch mounted on the control panel door. Upon restoration of the system, the trouble signal shall resound until the trouble silence switch is restored to the NORMAL position.

E. The incoming power to the system shall be supervised so that any power failures must be audibly and visually indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator.

F. All air handling units and return air fans shall shut down when smoke is detected by return air duct mounted smoke detectors at the unit, unless unit is an integral part of a smoke control system. Shutdown shall be achieved by relay closure signaled by the fire alarm panel. Exact location of smoke detectors shall be coordinated with Division 23 Contractor.

G. Fire alarm system shall have an auxiliary relay module for each air handling unit (AHU). This relay shall close upon smoke detection by any smoke detector associated with that air handler in ductwork or at fan powered VAV terminal boxes. Division 23 shall wire to temperature control system.

H. Each fan powered VAV HVAC terminal box or fan coil unit shall have a duct mounted smoke detector installed in the return air duct, with auxiliary relay base. Shutdown wiring is by Division 23.

I. Area type spot smoke detectors shall be installed within the HVAC ductwork for each smoke damper and combination fire/smoke damper. Smoke detector shall have auxiliary relay base and remote alarm light. Wiring to smoke damper shall be by Division 23 Contractor.

PART 2 PRODUCTS

2.01 FIRE ALARM PANEL

A. Fire Alarm Panel shall have separate zones for every addressable device. Panel shall be modular with solid state, microprocessor based electronics, expandable, semi-flush mounted cabinet with glass window and locking door. Program shall be stored in non-volatile memory. Features shall include:
1. 80 character English readout dynamic LCD display
2. Battery supervision
3. Multiple operator access levels
4. 800 event historical logging
5. Zone selectable alarm verification
6. Individual circuit disable
7. Alarm, trouble, power on, and supervisory service LED indicators
8. Alarm acknowledge, supervisory acknowledge, trouble acknowledge, alarm silence, and system reset buttons
9. Programmable "tone-alert" horn
10. Printer communication module
11. Remote station transmitter module for connection to 24 hour supervisory service
12. Synchronizing module for synchronized strobe visual devices.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of twenty-four (24) hours with five (5) minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic with 100% recharge within twelve (12) hours.

C. All external circuits requiring system operation power shall be 24 VDC and shall be individually protected at the control panel.

D. Digital communicator shall be four (4) channel, dual phone line with twenty-four (24) hour automatic test, and automatic overload protection reset.

E. Panel shall have spare capacity for twenty-five (25) additional initiating devices.

F. Fire alarm system shall contain a relay module for each air handler. Relay shall be programmed to close upon smoke detection by any smoke detector associated with that air handling system. Refer to Division 23 Drawings.

G. All hardware, software and firmware installed under this Contract, individually and in combination with each other shall function free of any fault in processing dates, and any information related to dates, (including calculating, comparing and sequencing information and/or functions which depend on dates) through and beyond January 1, 2029. Such fault free operation shall not require any modification after the system is installed and it shall be transparent to the user. If the hardware and/or software installed under this Contract interacts with any existing systems which do not already have this feature, this Contractor is to notify the Owner, in writing and in a timely manner, of the specific changes which the Owner must make to the existing systems to bring the combined system into compliance with this requirement.

2.02 REMOTE ANNUNCIATOR

A. Remote annunciator to have an eighty (80) character LCD display with English language readout, tone alert horn, control switches for alarm silence, system reset, alarm acknowledge, key switch, and black painted flush mounted steel cabinet.

2.03 SMOKE DETECTORS

A. Area smoke detectors shall be analog addressable smoke sensor type photoelectric devices that communicate smoke density values to the fire alarm control panel. Sensors shall have integral insect screens and RFI shielded electronics in a white plastic head and base. Detector base shall be addressable. Bases shall have LED status indicating light and locking tamper resistant screw. Detectors performing auxiliary control function such as elevator recall, smoke damper closing, or fire door release shall be associated with a Programmable Relay Module to perform the intended operation.

B. Duct mounted smoke detectors shall be similar to area smoke detectors but with sampling tube as required to span HVAC duct width, and remote LED indicator station. Addressable relay control module shall be provided for equipment shutdown. Housing shall be NEMA 4 gasketed and weatherproofed with internal heating means for applications where detector is located in an unheated space or on roofs. Tamper switch on cover. UL listed for 100-4000 fpm air velocity.

C. Remote LED indicator stations shall have a red status LED.

D. Duct smoke detector and area smoke detectors installed within return air HVAC ductwork shall have a test port installed upstream for aerosol smoke injection. Test port shall consist of pipe and elbow within ductwork upstream of detector, flexible hose with cap below ductwork at an accessible location. Product available from: Lifesafetytest.com.

2.04 HEAT DETECTORS

A. Heat detectors shall be analog addressable combination rate-of-rise and fixed temperature (135 degree Fahrenheit) sensing with RFI shielded electronics. Base shall have an LED status indicating light and locking tamper resistant screw.

2.05 MANUAL PULL STATIONS

A. Manual pull stations shall be red lexan semi-flush mounted push type double action with pull handle. Unit shall lock in the pulled position requiring a key to reset. Unit shall be individually addressable on the system. Status LED shall be visible through the front cover.

B. Manual pull stations shall have clear lexan tamper resistant cover over top, with integral battery and horn.

2.06 AUDIBLE/VISUAL DEVICES

A. Visual devices (strobes) shall be multi candela, 24 VDC, xenon flash unit, white semi-flush base assembly stating "FIRE," clear tamper resistant lexan lens. Candela settings shall be set per Part 3, Execution. Contractor shall verify with the AHJ that white is an acceptable color in their jurisdiction.

B. Combination audible/visual devices (horn/strobes) shall have multi candela 24 VDC xenon flash unit, clear tamper resistant lexan lens, 24 VDC, white semi-flush base assembly stating "FIRE," minimum 95 dB (at 10 feet) electronic horn. Contractor shall verify with the AHJ that white is an acceptable color in their jurisdiction.

C. Audible/visual devices installed on the exterior of building or in high humidity areas shall be weatherproof and moisture proof.

D. Provide synchronizing flash rate modules as needed to sync all strobes in the facility.

2.07 MONITOR AND CONTROL DEVICES

A. Dual Contact Relay IAM (Individual Addressable Module) control module shall provide relays with isolated contacts for controlling equipment.

2.08 MAGNETIC DOOR HOLDERS

A. Magnetic door holders shall be 24 VDC electromagnetic, flush wall or floor mounted single door devices. Provide Programmable Relay Module for each set of doors to remove power to doors during alarm condition.

2.09 REMOTE NOTIFICATION APPLIANCE CIRCUIT (NAC) POWER EXTENDER PANELS

A. Remote Notification Appliance Circuit (NAC) power extender panels shall be wall mountable, with locking hinged door cabinet. The panels shall contain batteries, charging circuit, and power supply.

B. The Notification Appliance Circuit panel shall be addressable or controlled by programmable relay modules. Strobe sync circuitry shall be built into each panel.

C. Each Notification Appliance Circuit panel shall have a minimum of 6 Amperes of notification circuit power and shall have a minimum of four (4) zones.

2.10 GRAPHIC MAP

A. Provide a graphic map of the facility showing room names and fire alarm initiating devices. One (1) map shall be provided at each annunciator location. Map shall have a Plexiglas cover and be in an aluminum frame.

2.11 BATTERIES

A. Batteries shall be sealed lead acid with a nominal life expectancy of five (5) years minimum. Batteries shall be manufactured in the USA, stamped with ship date from the manufacturer, and stamped with the date of system activation. Batteries shall not be stored in excess of one (1) month without having a continuous trickle current applied to maintain charge.

B. Batteries shall not be shipped and installed in the panels until the system pre-test is to be done by manufacturer's technician.

C. Perform and record a battery load test after Fire Life Safety Inspection is completed, and submit this information to the Engineer.

PART 3 EXECUTION

3.01 APPLICATION

A. Smoke detectors shown on the Drawings are located schematically. Maximum spacing between multiple smoke detectors in an area shall be 30 feet. No walls shall be more than 15 feet from a smoke detector. Smoke detectors shall not be installed within 3 feet of a HVAC diffuser. Wall mounted smoke detectors shall be installed at 12 inches from ceiling.

B. Programming shall be done by the Manufacturer's authorized representative. Division 26 Contractor shall include in the bid sufficient funds to cover three (3) visits of eight (8) hours duration each for programming changes to include re-burning of electronic hardware components, to be done at the completion of the project after the life safety test.

C. Visual device types shall be located as follows:

	Candela Level
Corridors	15/75
Rooms < 400 SF	15/75
All other spaces	110

D. Visual device types shall be located within 15 feet of end of corridor and within 15 feet of corridor doors.

E. Provide ceiling mounted smoke detector within 5 feet of fire alarm panel, and each NAC subpanel. Provide manual pull station next to fire alarm panel.

3.02 INSTALLATION

A. Follow Manufacturer's written instructions regarding mounting, wiring, and testing the fire alarm system. Installers shall be certified for fire alarm work by State Agencies.

B. Conductors shall be UL listed to work with manufacturer’s equipment. Installation shall be in accordance with the Manufacturer's wiring diagrams, recommendations, and in compliance with practices set forth by local, State and National fire codes. Color code and tag all wires at all junction points. Do not exceed 40% conduit fill capacity. All cables shall be UL listed for Fire Alarm Application. Fire alarm wiring shall be red. Conductors shall be Types FPLP and FPLR, inner and outer insulation: LS PVC-Low Smoke Polyvinyl Chloride, 75 degrees C, NFPA 262.

C. Duct mounted smoke detectors and duct mounted area detectors shall be installed in return ducts as directed by the mechanical equipment supplier under the supervision of the Division 23 Contractor, in a location that is accessible. Provide wiring to mechanical control equipment as necessary to achieve equipment control upon smoke detection. Install remote test stations at 60 inches above finished floor on adjacent wall in utility spaces, or in ceiling

D. All wiring shall be installed in conduit and independent of all other systems. Paint all junction boxes with red paint and label "Fire Alarm." Wiring configuration shall be “Class A” with return circuit permitted in same conduit.

E. Provide 3/4 inch conduit from digital communicator to telephone terminal board. Provide two (2) Category 6 cables from telephone board.

F. Smoke detectors located on either side of smoke doors and smoke shutters shall be installed between 1 foot and 5 feet of the door and connected to release magnetic door holders. Motorized smoke shutters with electric release shall have control power run from shutter operator through relay base of each smoke detector to electric release mechanism.

G. Provide 120 volt branch circuits for power to fire alarm control panel, equipment racks, remote control panels, power supplies, and sprinkler system air compressors.

H. Exterior cover of all fire alarm wiring shall be red.

I. The system shall be programmed by the Manufacturer to operate as described in Paragraph 1.05 - System Operation. In addition, the following sensitivity shall be programmed for smoke detectors in the following areas:

General Areas	2.5%
Duct Mounted Smoke Detectors	1.0%
Mechanical/Electrical/Telephone Rooms	1.0%
Elevator Lobbies	3.7%
Computer Areas	1.0%

J. Signaling device circuits shall be loaded to no more than 75% of capacity.

K. Provide relay modules and wiring connection from the fire alarm system to all security system controllers to cause stairway door locks, exterior doors, and other egress doors to be released. Coordinate location with security contractor.

L. Provide wiring from fire alarm panel to Emergency Responder Radio Repeater system for monitoring of supervision of system. As a minimum, the following conditions shall be monitored:
1. Antenna malfunction
2. Signal booster failure
3. Low battery capacity, sending a supervisory signal at 70% of battery capacity
4. Loss of normal AC power
5. Failure of battery charger

M. Provide relays as required to connect fire alarm system to auxiliary systems as specified in other Sections and noted on Drawings.

N. Provide conduit, wire, and addressable relay control module connection to dimming system panels for override to full lighting level.

O. Smoke detector bases shall be labeled with programmed address visible from floor when head is removed.

P. Provide an area type smoke detector within HVAC ductwork for each HVAC smoke damper shown on the HVAC Drawings. Detector shall be located within 5 feet of damper at access door location, in center of duct. Provide two (2) smoke detectors for ducts between 36 inches and 72 inches wide. Provide three (3) smoke detectors for ducts greater than 72 inches wide. Provide a system relay adjacent to smoke damper to signal damper to close.

Q. Area smoke detectors on ceilings shall be located at a minimum of 36 inches away from HVAC air supply or return diffusers.

R. Provide conduit and wire connection to main building management system control panel from fire alarm panel relays for remote monitoring of general alarm and trouble.

S. Smoke and heat detector bases shall have an adhesive tape label with the programmed address visible from floor when head is removed.

3.03 TESTING

A. Each zone in the fire alarm control panel and remote annunciator and each device shall be individually tested as installed in the building under the supervision of an authorized Manufacturer's Representative. Division 26 Contractor shall include in his/her bid, time for testing after normal work hours.

B. The complete fire alarm system shall be tested by the Division 26 Contractor as required by the Fire Marshal inspecting authority in the presence of the Owner's representative. Division 26 Contractor shall make all modifications as required by the Fire Marshal. Division 26 Contractor shall include in bid a second fire alarm system test of modifications made.

C. Operate system for a minimum of seven (7) consecutive days with no trouble conditions before claiming contract completion.

D. Complete and submit the required NFPA 72 test and inspection forms.

3.04 SPARE PARTS

A. Provide spare parts as follows:
   1. Smoke Detectors 5
   2. Manual Pull Stations 2
   3. Audio Visual Devices 2
   4. Heat Detectors 1
   5. Magnetic Door Holders 1

B. Division 26 Contractor shall include in his/her bid, an allowance for furnishing and installing (with average length of conduit and wire), the following for use as directed by the Architect. If not all used, remaining labor and material shall be credited to Owner:
   1. Audiovisual Devices 5
   2. Manual Pull Stations 1
   3. Tamper/Waterflow switches 2
   4. Duct Smoke Detectors 2
   5. Area Smoke Detectors 2
   6. Re-Programming Time 2 visits of 4 hours
   7. Shop Drawing Revisions 3 AHJ updates

C. Furnish ten (10) keys to open panels, pull stations and annunciators.

D. Obtain a signed copy of the Certificate of Material Receipt from Section 26 00 99, "Requirements for Contract Completion."

3.05 EQUIPMENT DEMONSTRATION

A. After all system operational tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by Manufacturer's authorized field technician. Include four sessions of four hours.

B. The instruction is to include the following:
   1. Location of all components of the system and explanation of their function

2. Demonstration of equipment
3. Maintenance and repair procedures
4. Programming procedures
5. Review of documents in Record and Information Manuals

C. All participants shall sign the Certificate of System Completion from Section 26 00 99, "Requirements for Contract Completion."

D. Training sessions shall be videotaped and two copies provided to owner on DVD in MPEG 3 format.

3.06 SMOKE DETECTOR SENSITIVITY TEST

A. All area and duct mounted smoke detectors shall have a sensitivity test conducted at the time of completion and during the eleventh month after date of Contract Completion. Sensitivity test shall be conducted by the Manufacturer's Representative. Clean all detectors that are out of their listed sensitivity range. Provide written documentation of test results.

3.07 WARRANTY OF WORK

A. The Division 26 Contractor shall warrant all materials, equipment and workmanship for a period of one (1) year from date of completion.

3.08 RECORD DRAWINGS

A. Provide a set of drawings of the fire alarm system indicating the wiring and raceway system layout. Locate drawings next to the fire alarm control panel.

END OF SECTION

SECTION 26 81 15
EMERGENCY RESPONDER RADIO ANTENNA/REPEATER SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Allowance: The Division 26 Contractor shall include in his/her Bid an allowance of $2 per square foot to furnish and install a complete emergency responder radio antenna/repeater system. The Division 26 Contactor shall provide actual invoice of charges and shall provide credit to Owner if charges are less than the allowance. If actual invoice is greater, the Division 26 Contractor shall submit a change order for the additional charge over the allowance.

B. Furnish, install, and test a complete and operating Emergency Responder Radio Antenna/Repeater System. The system will support the Fire Department radio system and other first responders. The system is not intended to support cell phone carriers or the Owner's private security and/or maintenance personnel radio systems, now or in the future.

C. This Section includes the requirements for an Emergency Responder Radio Antenna/Repeater System for the purposes of amplifying Emergency Responder radio signals to achieve minimum signal strength in 95% of all areas on each floor of the building. The contractor shall contact the authority having jurisdiction and obtain the current communications frequency.

D. Final acceptance and approval are required from the local Fire Department and other first responders in writing prior to contract closeout. If the system is capable of operating on a frequency that is licensed to a public service agency by the FCC, it cannot be installed without prior coordination and approval of the fire code official.

E. Section Includes
1. Bi-directional amplifiers (BDA's)
2. Distributed Antenna System
3. Coaxial cables
4. Splitters and direction couplers
5. UPS
6. All other equipment and components necessary for a complete and functioning Emergency Responder Radio Antenna/Repeater System.

1.02 STANDARDS

A. Codes, regulations and standards referenced in the Section are:
1. NFPA 1 – The National Fire Code (including Annex O)
2. NFPA 70 – The National Electrical Code
3. Ohio Fire Code, Rule 1301:7-7-05 Fire Service Features, Paragraph J, Section 510 Emergency Responder Radio Coverage
4. NFPA 101, Life Safety Code, the Ohio Basic Building Code, and Local Code and Building Authority requirements.
5. NFPA 72-16 National Fire Alarm Code
6. FCC 47 CFR Private Land Mobile Radio

7. 90.219-2007 Services-Use of Signal Boosters
8. ICC International Fire Code, Code and Commentary
9. Ohio Fire Code
10. ADA "Americans with Disabilities Act"
11. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields".
12. FCC Rules Part 22, Part 90 and Part 101.
13. International Fire Code, Section 510.

1.03 DEFINITIONS

A. Definitions:
   1. Bi-Directional Amplifier BDA: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station for enhanced signals and improved coverage.
   2. Emergency Responder Radio Coverage System: A two-way radio communication system installed to assure the effective operation of radio communications systems for fire, emergency medical services or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.
   3. Delivered Audio Quality Definitions (DAQ): This is a universal standard often cited in system designs and specifications.
      a. DAQ 1: Unusable, speech present but unreadable.
      b. DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion.
      c. DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
      d. DAQ 3.5: Speech understandable with repetition only rarely required. Some noise/distortion
      e. DAQ 4: Speech easily understood. Occasional noise/distortion.
      f. DAQ 4.5: Speech easily understood. Infrequent noise/distortion.
      g. DAQ 5: Speech easily understood. Coupled Bonding Conductor (CBC) – The term "Coupled Bonding Conductor" shall mean a bonding conductor placed, e.g. strapped, on the outside of any technology cable, used to suppress transient noise.
   4. FCC: Federal Communications Commission
   5. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
   6. Public Safety/First Responder: Public Safety or First Responder agencies which are charged with the responsibility of responding to emergency situations. These include, but are not limited to: law enforcement departments, fire departments, and emergency medical companies.

1.04 SUBMITTALS

A. Submit product data for each type of proposed system component specified, including dimensioned drawings showing minimum clearances and installed features.

B. Layout Drawings
   1. Component specification sheets shall be 8.5 inch x 11 inch or greater, scaled or dimensioned, with dimensions or scale clearly noted.
   2. Floor plan drawings shall be 24 inch x 36 inch minimum with drawings scaled to legible size.

3. Floor plan drawings may include elevation detail names for each elevation view. Sheet title shall include site name, address, sheet number, floor plan number and north arrow. Include site plan view of the subject buildings and surrounding property to clearly indicate the location and orientation of roof mounted outdoor antennas associated with the proposed system.
4. Include a minimum of (1) building elevation depicting the location of any outdoor antennas associated with the proposed system. Include height of antenna centerline above building, orientation, and location of all external grounding connections.
5. Include a detail plan view of all Telecommunications Spaces housing head-end and/or other consolidated equipment, showing the location of the rack(s) and/or enclosure(s) of the Emergency Responder Radio Antenna/Repeater System equipment.
6. Include a separate plan view of each interior floor where indoor antenna systems are proposed. Include antenna numbers, coaxial cable routes, and the locations of any other system components including splitters, couplers, filters, amplifiers, etc. All components shall be named or labeled for reference in power budget calculations tables. Overlay approximated coverage radii indicating –95 dBm downlink (base to mobile) signal strength around each proposed indoor coverage antenna. Include results of any previous coverage testing per grid, if available.
7. Include a minimum of one (1) detail elevation view(s) of all rack(s) and/or enclosure(s) housing the Emergency Responder Radio Antenna/Repeater System equipment. Identify each piece of equipment by brand, model number and equipment type (e.g. Acme BA123 RF amplifier).
8. Specify antenna grounding and surge protection in accordance with NEC Article 810.
9. Specify the backup power source (Life Safety), and include calculations to ensure the backup power requirements as specified in this standard are met.

C. Equipment Specification Sheets
   1. Provide copies of manufacturer specification sheets of all system components, including:
      a. Amplifiers
      b. Antennas
      c. Coaxial cable, couplers, splitters, combiners, or other passive components
   2. Operation and maintenance data
   3. Pass band curves in for the uplink and downlink portions of the NPSPAC band for any amplifiers, if not included in #1. Amplifiers may NOT amplify portions of other licensed services, including Nextel and Specialized Mobile Radio Licensee band, or Cellular A or B bands.
   4. Backup battery and charging system.

D. Submit wiring diagrams from manufacturer differentiating clearly between factory and field-installed wiring. Include diagrams for each component of the system with all terminals and interconnections identified. Make all diagrams specific to this Project.

E. Submit product certificates signed by the manufacturer of radio system components certifying that their products comply with specified requirements.

F. Submit agenda for training class and copies of all handouts for the class.

G. Maintenance data for radio system shall be included in the operation and maintenance manual. Include data for each type of product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

H. Record of field tests of the radio system shall be included in the operation and maintenance manuals.

I. Design Approval: Plans shall be submitted and approved prior to installation. The following information shall be provided to the local Fire Department unit representative by the system designer/Contractor:
   1. A minimum of three (3) copies of detailed drawings showing the location of the amplification equipment and associated antenna systems which includes a view showing building access to the equipment; and
   2. A minimum of three (3) copies of schematic drawings of the electrical system, backup power, antenna system and any other associated equipment relative to the amplification equipment including panel locations and labeling.
   3. A minimum of one (1) copy of the Manufacturer's data sheets on all equipment to be installed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: The lead installation personnel shall have a valid FCC-issued general radio operators license and shall have a certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed. Engage an experienced factory-authorized installer to perform work of this Section.

B. Designer Qualifications: The system designer shall have a valid FCC-issued general radio operators license and shall have a certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.

C. Single-Source Responsibility: Obtain radio system components from a single source who assumes responsibility for compatibility of system components.

D. All equipment shall be UL listed and labeled, and in accordance with applicable NEMA and ANSI Standards. Where copper cabling is routed to an area, either in another building, or with a separate electrical service, the Technology Contractor shall provide primary protective equipment.

E. All racks and enclosures shall be either welded or assembled with paint piercing ground washers, grounding strip and bonding jumper as indicated on the Drawings.

1.06 MANUFACTURERS

A. Subject to compliance with requirements, available Integrators offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Comba

2. Honeywell
3. Corning
4. Zinwave
5. CommScope/Andrews
6. Engineer-approved equivalent

PART 2 PRODUCTS

2.01 GENERAL PERFORMANCE REQUIREMENTS

A. Compatibility: The equipment, including but not limited to repeaters, transmitters, receivers, signal boosters, cabling, fiber distributed antenna system, etc., shall not interfere with the existing communication systems utilized by the Public Safety and First Responder agencies.

B. Power Supplies: At least two (2) independent and reliable power supplies shall be provided, one primary and one secondary. The primary power source shall be supplied from a dedicated 20 ampere branch circuit and comply with 10.6.5 of NFPA 72. The secondary power source shall be a dedicated battery, capable of operating the in-building radio system for at least 24 hours of 100% system operation. The battery system shall automatically charge in the presence of external power input. The battery system shall be contained in a NEMA 4-type waterproof enclosure. Monitoring the integrity of power supplies shall be in accordance with 10.6.9 of NFPA 72.

C. Survivability
1. Physical Protection: All wiring and fiber optics shall be installed in conduit. Refer to Section 26 05 33, "Conduit and Fittings" for type, sizing and installation standards.
2. Fire Performance: All main risers or trunks of the antenna system shall be installed with resistance to attack from a fire using one of the following methods:
   a. A 2-hour fire rated cable or cable system.
   b. Routing the cable through a 2-hour fire rated enclosure(s) or shaft(s).
   c. A system configured in a looped design, routed through 1-hour fire rated enclosure(s) or shaft(s). The circuit shall be capable of transmitting and receiving a signal during a single open or non-simultaneous single ground fault on a circuit conductor.
   d. Performance alternative approved by the authority having jurisdiction.
3. Cabinet: The signal booster and all associated RF filters shall be housed in a single, NEMA 4 certified, painted steel weather tight box. The cabinet shall be large enough to dissipate internal heat without venting the inside of the cabinet to the outside atmosphere. Operating temperatures: –22 degrees F to +120 degrees F (–30 degrees C to +50 degrees C) minimum temperature range, including microprocessors. Equipment installed on the roof of structures shall be rated for the expected extreme temperatures associated with rooftop installations.
4. Passive Equipment: Passband shall be 700-900 MHz, IP rating of 2 GHz.
5. Cable: Passband shall be 700-900 MHz. Cable shall be rated for fire plenum and riser rating.

D. Future Expansion
1. The system shall be capable of modification or expansion to enable the system to adapt to frequency changes or additions required or made available by the FCC.

2.02 SYSTEM COMPONENTS

A. Signal Strength
1. Downlink: A minimum signal strength of -95 dBm shall be provided throughout the coverage area.
2. Uplink: Minimum signal strength of -95 dBm received at the local Fire Department Radio System from the coverage area.
3. A donor antenna must maintain isolation from the distributed antenna system. The donor antenna signal level shall be a minimum of 15 dB above the distributed antenna system under all operating conditions.

B. Permissible Systems
1. Buildings and structures shall be equipped with an FCC Certificated Class B Bi-Directional UHF Amplifier(s) as needed.

C. Supported Frequencies: The radio system shall support frequencies in the 700 and 800 MHz public safety bands as utilized by the local Fire Department.

D. Reject Filters: Notch filter sections shall be incorporated to minimize adjacent channel cellular and SMR (Nextel) degradation of the signal booster performance. The minimum downlink band adjacent band rejection shall be 35 dB or greater at 865 MHz and 870 MHz.

E. Band Migration Capability: The signal booster shall include re-tunable or replaceable filters to accommodate rapid and economic passband changes in the event of mandatory FCC changes within the NPSPAC band. The use of non-adjustable and non-replaceable RF input and output filters is prohibited.

F. Output Level Control: An automatic output leveling circuit shall be included for both passbands with a minimum dynamic range of 60 dB, less any gain reduction setting, to maintain FCC out of band and spurious emission compliance.

G. Degraded Performance in Emergencies: The system shall be designed to allow degraded performance in adverse conditions, such as abnormally high temperatures resulting from nearby fires, extreme voltage fluctuations or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) will not be implemented as the standard mode for public safety applications.

H. Mode of Operation: The system shall be normally powered on and shall continuously provide passing of frequencies within the Public Safety and First Responder bands.

I. All in-building radio systems shall be compatible with both analog and digital communications simultaneously at the time of installation.

2.03 SYSTEM MONITORING

A. The distributed antenna system shall include a connection to the fire alarm system to monitor the integrity of the circuit of the signal booster(s) and power supplies; monitored connection shall comply with 12.6 of NFPA 72. Any connection malfunction shall annunciate on the fire alarm system.

B. A sign shall be located at the fire alarm panel with the name and telephone number of the local Fire Department indicating that they shall be notified of any failures that extend past the 2 hour time limit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Distribution System Signal Wires and Cables
1. Wires and cables shall enter each equipment enclosure, console, cabinet or rack in such a manner that all doors or access panels can be opened and closed without removal or disruption of the cables.
2. Routing and Interconnection
   a. Wires or cables routed between consoles, cabinets, racks, and other equipment shall be installed in an approved conduit or cable tray that is secured to building structure.
   b. Completely test all of the cables after installation and replace any that are found to be defective.
3. Install cables without damaging conductors, shield, or jacket.
4. Do not bend cables, while handling or installing, to radii smaller than as recommended by manufacturer.
5. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

B. Product Delivery, Storage, and Handling
1. Delivery: Deliver materials to the job site in OEM's original unopened containers, clearly labeled with the OEM's name and equipment model and serial identification numbers.
2. Store and protect equipment in a conditioned space until installation.

C. System Installation
1. Coaxial antenna cabling shall not be installed in the same conduit, raceway, or cable trays used for other systems. Run separately attached to building structure.
2. All equipment shall be connected according to the OEM's specifications to insure correct installation and system performance.
3. Coordinate all roof penetrations with Owner and/or roofing contractor.
4. Install DAS equipment cabinet in the telecom room located on the top floor of the building. Panels 120 volt branch circuits from emergency system as required,

3.02 LICENSING

A. All fees associated with the licensing shall be paid by the Owner.

B. All testing must be done on frequencies authorized by the FCC.

3.03 GROUNDING

A. Ground cable shields and equipment per Manufacturer's requirements.

B. Antenna mast shall be grounded per NFPA 70 NEC requirements, Section 26 05 27, "Telecommunications Bonding Infrastructure" and antenna manufacturer's requirements. Provide grounding blocks and surge protection for outside coaxial cabling. Bond the antenna mast to the existing lightning protection system.

3.04 APPROVAL TESTING

A. The local Fire Department will review plans and specifications. Upon acceptance, plans will be stamped to indicate approval. Stamped plans are required to be present at the acceptance test. Any field changes that occur during construction shall be incorporated into new As-Built plans, including any manufacturer's data sheets for any equipment changes not submitted in the original submittal. As-Built plans, if required due to system changes, shall be submitted to the local Fire Department for approval.

B. Tests shall be made using frequencies close to the frequencies used by the Fire Department and appropriate emergency services. If testing is done on the actual frequencies, then this testing must be coordinated with the local Fire Department unit. All testing must be done on frequencies authorized by the FCC. A valid FCC license will be required if testing is done on frequencies different from the police, fire or emergency medical frequencies.

C. Testing Procedures
1. Minimum Signal Strength: For testing system signal strength and quality, the testing shall be based on the delivered audio quality (DAQ) system. A DAQ level below 3.0 shall be considered a failed test for a given grid cell.
2. Measurements shall be made with the antenna held in a vertical position at 3 to 4 feet above the floor to simulate a typical portable radio worn on the belt or turnout coat pocket.

D. Final Acceptance Testing
1. Where an emergency responder radio coverage system is required, and upon completion of installation, the radio system shall be tested to verify that two-way coverage on each floor of the building is not less than 90%. The test procedure shall be conducted as follows:
   a. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.
   b. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency’s radio communications system.
   c. Failure of more than two nonadjacent test areas shall result in failure of the test.
   d. In the event that three of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of more than four nonadjacent test areas shall result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 90% coverage requirement.
   e. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency’s radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered failure of that test area. Additional test locations shall not be permitted.

f. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.
g. As part of the installation, a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at the time of installation and subsequent annual inspections.

2. All acceptance testing shall be done in the presence of a local Fire Department representative or by the local Fire Department unit at no expense to the City.
3. Small scale drawings (11 inch x 17 inch maximum) of the structure shall be provided by the Contractor to the Owner. The plans shall show each floor divided into the grids as described above, and the results of the pre-testing. Each grid shall be labeled to indicate the DAQ result from the final acceptance testing.
4. The Contractor shall provide the latest approved plans for the system, including any manufacture's data sheets for any equipment changes not submitted in the original submittal to the Owner.
5. Include testing results of the repeater (output wattage, gain level, etc.) and connection to the fire alarm.

3.05 MAINTENANCE AND ANNUAL TESTING

A. Annual tests will be conducted by the local Fire Department unit or authorized company.
1. The re-testing will be done at no expense to the City or the appropriate emergency services departments as required in the original testing procedures.

B. Maintenance Contract
1. Maintenance contract with a Radio Service Provider in place with name of authorized company, who will provide a 24 hour by 7 day emergency response within two (2) hours after notification. The system shall be maintained in accordance with FCC requirements. The contract shall be for 5 years.
2. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Telephone Operator License, or a technician certification issued by the Association of Public-Safety Communications Officials International (APCO) or equivalent as determined by the local Fire Department.
3. Maintain a list of contact personnel with phone numbers at the radio repeater system cabinet. The contact personnel shall have knowledge of the building and the repeater system and be available to respond to the building in the case of an emergency.
4. Radio Service Provider maintenance contract shall include but be not limited to:
   a. Annual Test
      1) All active components of the distributed antenna system, including but not limited to amplifier, power supplies, and back-up batteries, shall be tested a minimum of once every 12 months.
      2) Amplifiers shall be tested to insure that the gain is the same as it was upon initial installation and acceptance. The original gain shall be noted and any change in gain shall be documented.

3) Back-up batteries and power supplies shall be tested under load for a period of 1 hour to verify that they will operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.
4) Active components shall be checked to determine that they are operating within the manufacturer's specifications for their intended purpose.
5) Documentation of the test shall be maintained on site and a copy forwarded to the local Fire Department Radio Supervisor upon completion of the test.

5. Fire Department Radio personnel, after providing reasonable notice to the Owner or their representative, shall have the right to enter onto the property to conduct field testing to be certain that the required level of radio coverage is present

END OF SECTION

SECTION 26 81 18
RF SURVEY FOR EMERGENCY RESPONDER RADIO ANTENNA/REPEATER SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Conduct a survey using a RF Spectrum Analyzer to analyze the signal strength of Emergency Responder Radios in the building and determine if amplification of the signal is required.

B. Survey should be performed after the building is substantially completed.

1.02 DESIGN CRITERIA IF REQUIRED

A. The RF Performance characteristics of the Owner's facility must be determined prior to initiation of the detailed facility DAS design process.

B. The System shall distribute Public Safety channels with a signal strength that exceeds the minimum requirements specified by the AHJ. Public Safety includes police services, local and city police, county sheriff, emergency medical services, and fire departments.

C. The System shall distribute RF coverage at levels outlined below in the following areas of the building(s) — herein specified coverage areas:
1. Floor areas including corridors, lobbies, concourse, and internal spaces
2. Penthouses
3. Bridges/building links
4. Stairwells
5. Elevator lobbies
6. General use spaces (break rooms, staff rooms)
7. Restrooms
8. Exterior public spaces (e.g. courtyards)

D. The system must have 95 percent coverage of all areas of each building level.

E. UHF (380-430, 450-512 MHz)

F. LMR 700/800 MHz - Land Mobile Radio

G. Frequencies for the following radio systems shall be supported. The DAS vendor shall confirm the frequencies required at the time of facility opening.
1. Federal DHS Trunk
2. Local PD
3. City PD
4. County Sheriff
5. Fire Department
6. Internal Facilities

H. The System shall have active elements that filter and amplify signals on a frequency specific basis to consistently deliver wireless services at the appropriate power levels.

I. There shall be no interference between the applications and wireless operators.

1.03 REGULATIONS

A. Codes, regulations and standards referenced in the Section are:
1. NFPA 1 – The National Fire Code (including Annex O from 2009)
2. NFPA 70 – The National Electrical Code
3. Ohio Fire Code, Rule 1301:7-7-05 Fire Service Features, Paragraph J, Section 510-Emergency Responder Radio Coverage
4. NFPA 101, Life Safety Code, the Ohio Building Code, and Local Code and Building Authority requirements.
5. NFPA 72 National Fire Alarm Code
6. FCC 47 CFR Private Land Mobile Radio
7. 90.219 Services-Use of Signal Boosters
8. ICC International Fire Code, Code and Commentary
9. Ohio Fire Code
10. ADA "Americans with Disabilities Act"
11. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields"
12. FCC Rules Part 22, Part 90 and Part 101

1.04 DEFINITIONS

A. Definitions:
1. Bi-Directional Amplifier BDA: Device used to amplify band-selective or multi-band RF signals in the uplink, to the base station for enhanced signals and improved coverage.
2. Emergency Responder Radio Coverage System: A two-way radio communication system installed to assure the effective operation of radio communications systems for fire, emergency medical services, or law enforcement agencies within a building or structure. A system used by firefighters, police, and other emergency services personnel.
3. Delivered Audio Quality Definitions (DAQ): This is a universal standard often cited in system designs and specifications.
   a. DAQ 1: Unusable, speech present but unreadable
   b. DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion
   c. DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
   d. DAQ 3.5: Speech understandable with repetition only rarely required. Some noise/distortion
   e. DAQ 4: Speech easily understood. Occasional noise/distortion
   f. DAQ 4.5: Speech easily understood. Infrequent noise/distortion
   g. DAQ 5: Speech easily understood. Coupled Bonding Conductor (CBC) – The term "Coupled Bonding Conductor" shall mean a bonding conductor placed, e.g. strapped, on the outside of any technology cable, used to suppress transient noise.
4. FCC: Federal Communications Commission
5. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

6. Public Safety/First Responder: Public Safety or First Responder agencies that are charged with the responsibility of responding to emergency situations. These include, but are not limited to law enforcement departments, fire departments, and emergency medical companies.
7. RSSI: Received signal strength indicator RSSI is a measurement of the power present in a received radio signal.
8. BER: Bit Error Rate is the number of bit errors per unit time

1.05 EXECUTION

A. The RF survey for retrofit facilities can be completed immediately for site specific requirements and RF propagation performance in all frequency bands of interest.
   1. Interference sources should be identified, localized to source, and a mitigation plan established.
   2. Highly shielded portions of the existing facility must be identified (such as MRI, X-ray, or Faraday cage protected rooms) and a strategy for increasing RF performance in and around these locations must be addressed.
   3. An RF heat map must be created which indicates relative RF field strength for each frequency band of interest.
   4. Space planning surveys must be completed which identify where all active and passive components will be installed.

B. The RF survey for new construction facilities may have a preliminary design completed for the purpose of budgetary projections; however, all final radiating device locations should not be determined until the following infrastructure is in place and an RF survey is completed:
   1. Structural elements impacting RF absorption, shielding and reflectivity such as walls, and ceiling are in place.
   2. Window tint treatments (due to their shielding characteristics) have been completed.

C. For both retrofit and new construction, tests shall be made using frequencies close to the frequencies used by the Fire Department and appropriate emergency services. If testing is done on the actual Fire Department frequencies, then this testing must be coordinated with the Local Fire Department unit. All testing must be done on frequencies authorized by the FCC. A valid FCC license will be required if testing is done on frequencies different from the police, fire, or emergency medical frequencies.

D. Testing Procedures
   1. Minimum Signal Strength: For testing system signal strength and quality, the testing shall be based on the delivered audio quality (DAQ) system. A DAQ level below 3.0 shall be considered a failed test for a given grid cell.
   2. If measurements are done without the fire department equipment, the measurement shall be made with the antenna held in a vertical position at 3 to 4 feet above the floor to simulate a typical portable radio worn on the belt or turnout coat pocket.
   3. 3. A minimum signal strength of -95 dBm shall be provided throughout the coverage area for both uplink and downlink by the Local Fire Department.
      a. RSSI measurement
      b. BER testing

E. Tools used for RF survey completion:
   1. The RF spectrum analyzer is the most accurate survey tool available and will provide detailed and discrete RF signal levels in each frequency band of interest.
   2. Software based survey tools are becoming more useful for projecting propagation analysis and creating graphical analysis such as heat maps based on actual RF spectrum field measurement data input by survey personnel.
   3. RF Communication Service monitors and RF field strength meters may be utilized to determine signal coverage within an area.
   4. Hand held RF transceivers and cell phones may be used to determine signal level in their specific channel; however, this would be considered a basic survey and should not be utilized as the survey basis for design.
   5. RF signal sources and carrier generators may be used to simulate the presence of an RF signal in order to model a facility propagation study and survey.

F. Acceptable manufacturers of testing equipment: Spectrum Analyzers, JDSU, Agilent,

1.06 SUBMITTALS

A. Submit testing data for each level of the building.
   1. An RF heat map of the building which indicates relative RF field strength for each frequency band of interest must be submitted.
   2. The map should indicate clearly the areas that have passed or failed based on the above parameters.
   3. Space planning surveys must be completed which identify where all active and passive components will be installed.
   4. If testing is done with the public safety/first responder equipment, the study of compliance needs to be signed by the agency as passing the DAQ level 3.0 test.

B. If necessary, a layout of the antenna system that will be utilized to remedy any deficiencies in coverage. Include component specification sheets and detail drawings of the system.
   1. Floor plan drawings may include elevation detail names for each elevation view. Sheet title shall include site name, address, sheet number, floor plan number, and north arrow. Include site plan view of the subject buildings and surrounding property to clearly indicate the location and orientation of roof mounted outdoor antennas associated with the proposed system.
   2. Include a minimum of (1) building elevation depicting the location of any outdoor antennas associated with the proposed system. Include height of antenna centerline above building, orientation, and location of all external grounding connections.
   3. Include a detail plan view of all Telecommunications Spaces housing head-end and/or other consolidated equipment, showing the location of the rack(s) and/or enclosure(s) of the Emergency Responder Radio Antenna/Repeater System equipment.
   4. Include a separate plan view of each interior floor where indoor antenna systems are proposed. Include antenna numbers, coaxial cable routes, and the locations of any other system components including splitters, couplers, filters, amplifiers, etc. All components shall be named or labeled for reference in power budget calculations tables. Overlay approximated coverage radii indicating –95 dBm downlink (base to mobile) signal strength around each proposed indoor coverage antenna. Include results of any previous coverage testing per grid, if available.

5. Include a minimum of one (1) detail elevation view(s) of all rack(s) and/or enclosure(s) housing the Emergency Responder Radio Antenna/Repeater System equipment. Identify each piece of equipment by brand, model number, and equipment type (e.g., Acme BA123 RF amplifier).
6. Specify antenna grounding and surge protection in accordance with NEC Article 810.
7. Specify the backup power source (Life Safety), and include calculations to ensure the backup power requirements as specified in this standard are met.

END OF SECTION

SECTION 27 00 00
DIVISION 27 - COMMUNICATIONS INTRODUCTORY STATEMENT

PART 1 GENERAL

1.01 REQUIREMENTS

A. All work included under this heading is subject to the Bidding Requirements, the Instructions to Bidders, the General Conditions, and/or the Division 1 General Requirements written for this entire Specification and shall apply to all work herein.

B. In addition to conforming to the documents listed in Paragraph 1.01A above, the Work performed by the Division 27 Contractor shall conform to all provisions of Sections 27 00 00 through 27 99 99 as included and made part of this Specification. The Division 27 Contractor is to consider the word "Contractor" when used in these Sections to mean himself/herself.

C. The Division 27 Contractor must read the entire Specifications of all divisions because he/she will be responsible for any and all Work described in other Sections where reference is made to Division 27 and/or Communications Contractor.

1.02 APPLICABLE SECTIONS

A. Division 27 Contractor shall perform work described in the preceding paragraphs, and as it relates to Division 27 work in the following Sections (as included):

03 30 00	Cast-in Place Concrete
26 00 10	Coordination Between Trades
26 00 11	Coordination with Utility Companies
26 00 55	Sleeves, Seals and Firestops
26 05 10	Wire and Cable
26 05 26	Grounding & Bonding
26 05 27	Telecommunications Bonding Infrastructure
26 05 29	Hangers and Supports (Seismic Loads)
26 05 33	Conduit and Fittings
26 05 34	Outlet Boxes
26 05 35	Low Voltage Outlet Boxes
26 05 36	Pull and Junction Boxes
26 05 43	Underground Raceways

B. Where reference is made to the Division 26 Contractor in the above applicable Division 26 Specification Sections, it shall be construed to mean Division 27 Contractor.

C. Refer to 26 05 27 Telecommunications Bonding Infrastructure for Division 27 grounding and bonding requirements.

1.03 RESPONSIBILITY

A. The Engineer's efforts under this Contract are aimed at designing a project that will be safe during construction and after full completion of the project. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed must not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

B. If a conflict occurs between the Drawings and/or the Specifications, immediately call the conflict to the attention of the Architect at least ten (10) days before bids are submitted, so an addendum clarification may be issued. Conflicts not brought to the Architect's attention before bids are due, shall be priced by the Contractor to include the most expensive, highest quality and quantity of the conflicting items in question.

1.04 CONTRACTOR QUALIFICATIONS

A. The Division 27 Contractor approved for this project shall meet the following qualifications and provide information as listed.
   1. Must be a member of Building Industry Consulting Service International (BICSI) or have at least five (5) years' experience in Telecommunications Industry.
   2. A list of a minimum of five (5) projects over $100,000 that the firm has completed along with contact names and phone numbers of the Owner's Representatives for those projects. At least three (3) of the completed facilities shall have been occupied and in full operation for at least one (1) year.
   3. Manufacturers shall have, within 150 miles, a service department of a duly authorized distributor who stocks standard parts on the premises.
   4. Refer to individual specification sections for additional qualifications.

END OF SECTION

SECTION 27 00 15
SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

A. Refer to the GENERAL CONDITIONS and Division 1 for general requirements.

B. Materials and equipment installed in this work shall meet all the requirements of the Contract Documents and no materials or equipment shall be ordered until submittals are reviewed and approved by the Architect and Engineer.

C. Submit complete catalog data or shop drawings for each manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, dimensional data, material gauge or thickness, wiring diagrams, brand name, catalog number, and general type.

D. Catalog data for equipment reviewed by the Engineer shall not take precedence over the requirements of the Contract Documents. The review of the Engineer shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Trades.

E. When submitted for review, all shop drawings shall bear the Contractor's signed certification that he/she has reviewed, checked, and approved the shop drawings, that they have been coordinated with the requirements of the project and with the provisions of the Contract Documents, and that he/she has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. Annotations shall be in red ink.

F. Each required Specification Section submittal shall be complete with all required information included in one PDF file. External web links are not permitted. Include a transmittal cover page indicating Specification Section name and number.

G. Submittals shall be sent to shopdrawings@korda.com.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Complete review of shop drawings, product data, and samples prior to submission.

B. Determine and verify:
1. Field Measurements
2. Field Construction Criteria
3. Catalog Numbers and Similar Data
4. Conformance with Specifications

C. Coordinate each submittal with requirements of the work and the Contract Documents.

D. Include a letter in the front of the submittal of any deviations in the submittals from the requirements of the Contract Documents.

E. Make submittals and resubmittals, if necessary, promptly in accordance with the approved schedule and in such sequence as to cause no delay in the work or in the work of any other Contractor, or the project as a whole.

F. Make any corrections or changes in rejected submittals as required by the Architect and resubmit until approved.

G. Begin no fabrication or work which requires submittals until approved submittals are returned.

1.03 INCORPORATION OF SUBMITTALS INTO RECORD AND INFORMATION MANUALS

A. Refer to Section 27 00 20, "Record and Information Manuals."

1.04 CERTIFICATIONS

A. Provide:
1. Test Agency results verifying capacities, operating conditions and power requirements at design conditions
2. Manufacturer's Statement of Compliance with Standards discussed in individual Specification Sections
3. Equipment labels indicating Certification requirements
4. Quality standard designations on each unit piece
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with
6. Other Certifications listed in other Sections of the Specifications

1.05 REQUIRED SUBMITTAL INFORMATION

A. Submittal Transmittal
1. Provide the following information on the Transmittal Form for each submittal:
   a. Project name and address.
   b. Specification number, as listed for each submittal item required in Paragraph 1.05C below.
   c. Item description, as listed for each submittal item required in Paragraph 1.05C below. Where equipment is identified by number or tag on the documents, same shall be indicated on the submittal.
   d. Specification number and item description (b and c, above) for each submittal if more than one submittal is sent under one transmittal form.
   e. Name, address and telephone number of Contractor.
   f. Bid package number (if applicable).
2. Submittal Transmittal Forms not properly identified with the above information will be returned (without review) to the Contractor.

B. Refer to the following letter key:

KEY FOR REQUIRED SUBMITTALS:

A. Shop Drawings and/or Layout Drawings
B. Product Data Sheets

C. Wiring Diagrams
D. Installation, Operation, and Maintenance Instructions (Due at the end of project)
E. Reports or Test results (Due at the end of project)

C. Submit information on equipment items as listed below.

SECTION #	CONTRACT ITEM	SUBMITTALS REQUIRED
27 00 20	RECORD AND INFORMATION MANUALS	A, B, C, D
27 10 00	STRUCTURED CABLING SYSTEM	A, B, E
27 41 05	VIDEO MONITOR DISPLAY SYSTEM	A, B, D, E
27 41 30	MULTIPURPOSE ROOM AUDIO/VIDEO SYSTEM	A, B, C, D, E

D. After approval, one (1) copy shall be returned to the Contractor. Contractor shall make prints of the approved transparencies and reproductions of all other shop drawing information as necessary for his/her use and for inclusion in the Record and Information Manuals.

END OF SECTION

SECTION 27 00 20
RECORD AND INFORMATION MANUALS

PART 1 GENERAL

1.01 RECORD DRAWINGS

A. Refer to Division 1 for general requirements as well as for specific information regarding Record (As-Built) Drawings. All drawings shall be provided in electronic PDF format.

1.02 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 for general requirements and for specific information regarding Operation and Maintenance Manuals, including required format(s) (paper and/or electronic) and quantity. If no such requirements are listed in Division 1, provide in electronic format. Submit one (1) copy of draft manual to the Architect for review and approval thirty (30) days before final inspection is due. After approval, submit three (3) approved manuals to the Owner and obtain receipt. (See Section 26 00 99, "Requirements for Contract Completion.")

B. Paper Copy Manuals shall be loose leaf, three-ring, heavy-duty hard-cover binders. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.

C. Electronic Copy Manuals shall be PDF file format. Individual documents shall have filenames corresponding to specification sections and system names. Each document shall have bookmarks corresponding to the systems, subsystems, and equipment names. Use electronic files prepared by manufacturers where available.

D. The following items, together with any other necessary pertinent data, shall be included in each Manual:
   1. Each manual shall be labeled on front cover with project name, Contract, Contractor's name, Architect, Engineer, and date of project completion.
   2. Manufacturers' names, nearest Factory Representative, and model and serial numbers of components of systems
   3. Operating instructions, start-up and shutdown procedures
   4. Maintenance instructions
   5. Routine and 24 hour emergency service/repair information:
      a. Name, address, and telephone number of servicing agency
      b. Names of personnel to be contacted for service arrangements
   6. Parts list with numbers of replaceable items, including sources of supply
   7. Manufacturers' literature describing each piece of equipment
   8. One (1) approved copy of each submittal
   9. Written warranties
   10. Certificate of Material Receipt and Certificate of System Completion
   11. Record (As-Built) Drawings
   12. IP and MAC address identified for each item required to have an address

13. Certificate of Final Inspection signed by Building Authority Having Jurisdiction
14. Test results
15. Video recordings of all equipment demonstrations and training sessions

END OF SECTION

SECTION 27 10 00
STRUCTURED CABLING

PART 1 GENERAL

1.01 DESCRIPTION

A. This document describes the product and execution requirements related to furnishing and installing the Structured Cabling System as shown on the Drawings and specified herein.

1.02 SCOPE OF WORK

A. The Structured Cabling Contractor (SCC) shall provide a complete Structured Cabling System (SCS) as defined in this section.

B. The SCC shall provide, test, and certify all Category cabling, not only as listed herein, but also as required in all Division 27 and/or Division 28 specifications included with this project.

C. As described elsewhere in these Documents the system consists of fiber optic and copper cabling, and related hardware. In addition to the basic cable plant requirements, the testing and identification requirements are also defined. Finally, racks, enclosures and other related hardware are indicated herein.

D. The installation shall be of an "Open System," using standard media and layout, standard connections and interfaces. The Contractor shall adhere to this Specification, local and national codes and provide quality workmanship.

E. This section includes:
1. Main Telecommunications Room (MTR)
2. Racks, Enclosures and Cable management
3. Rack mounted surge suppressor
4. Lightning Protector
5. Backbone cabling
6. Horizontal cabling
7. Consolidation Points
8. MTR connections
    a. Patch Panels
    b. Fiber enclosures
9. Work Area outlets
    a. Faceplates
    b. Connectors (jacks)
10. Work Area Extensions to Device
11. Hangers and Supports

F. The components used on this project for voice, data, and CATV shall be as identified in Part 2 of this Section.

G. Unless noted otherwise on the Drawings, for all 4 pair Category cable, this project shall use T568B termination for eight (8) position jack pair assignments as specified per the ANSI/TIA 568-C wiring standard. For fiber, follow ANSI/TIA 568-C.3, Optical Fiber Cabling Components Standard, and its published addenda.

H. All continuous pathways (i.e., conduit, cable tray, raceway, etc.) required to support the cabling shall be provided by the Electrical Contractor under Division 26 unless indicated otherwise in the Contract Documents.
   1. All non-continuous or non-rigid pathways (i.e., J-hooks, inner-duct, etc.) required to support the cabling shall be provided by the SCC under the Structured Cabling System, unless indicated otherwise in the Contract Documents.
   2. All cable tray, and related pathway hardware built into Telecommunications Spaces shall be provided by the SCC.

I. The SCC shall be responsible for providing the racks and enclosures as required and specified herein.

J. The SCC shall test and label the entire installation as specified and required by the codes and standards.

K. The SCC shall be responsible for providing the hangers and support system specified herein and shown on the Drawings.

L. Final sizing and location of J-hooks, hangers, and supports shall be the responsibility of the Contractor. However, NO increases to the bid price and/or the schedule extension shall be allowed due to equipment alterations.

M. For new installations, J-hooks fill capacity shall not exceed 70% of its rated cable fill capacity (i.e., if J-bracket is rated for 100 cables, no more than 70 shall be installed).

N. J-hooks are intended for voice, data, video, audio, and security cables only. They are intended for cable routing in areas of less than 100 Category 6 cables. All other low voltage cabling systems, such as building controls, shall have cabling run-ins separate raceway system.

O. All hangers and support material shall be galvanized or stainless-steel, rust-free material.

P. The Telecommunications Contractor shall ensure that the General Contractor and Painting Contractor acknowledge that the painting or over spray of any single or group of 4 pair horizontal telecommunications Category cable is not allowed. Any painted or over sprayed cable(s) shall be completely removed and replaced at the Painting Contractor's expense. No in-line connectors, splices, taps or other repairs will be permitted. Painted cable will not be covered as part of an extended warranty. Painted cable obscures the print legend and can alter the cable's mechanical properties and fire rating. Painted cable compromises its integrity and/or performance. It may act as an accelerant or create an additional smoke hazard in the event of a fire and as such this is considered a life safety issue. Paint contamination and/or removing paint from the cable with a solvent can affect the cable's durability and its electrical characteristics.

1.03 QUALIFICATIONS

A. The SCC must meet the following requirements to be approved for this project. He/she shall meet the following qualifications and provide the information, as listed, in the submittal package:
   1. Must be a member of Building Industry Consulting Service International (BICSI) or Engineer approved, other Telecommunications Organization, and shall have at least five (5) years' experience installing Telecommunications Cabling and Equipment.
   2. Supply a list of a minimum of five (5) projects over $100,000 that the firm has completed along with contact names and phone numbers of the Owners' Representatives for those projects. At least three (3) of the completed facilities shall have been occupied and in full operation for at least one (1) year.
   3. The SCC shall be a certified installer for the connectivity and cabling solution specified for this project and maintain that status with the warranting manufacturer, including all training requirements, for the duration of the cable infrastructure project.
   4. The SCC shall have, as a direct employee, a minimum of one (1) RCDD on staff. The RCDD must be a full-time employee of the company and must be listed with the company on the BICSI Credential Holder website. This individual shall review all submittals, RFIs, change order proposals, as-built documents, and shall provide system engineering support and oversight of all field work to ensure system installation is fully compliant with all requirements of ANSI/TIA-568-C, ANSI/TIA-569-D, and all associated TSBs, ANSI/TIA-606-B, labeling, and ANSI/TIA-607, bonding and grounding, including all addenda.
   5. The SCC's RCDD shall stamp all test results included in the Record and Information Manual and the final (field marked) As-Built Drawings, as being correct and accurate, that are included in the Record and Information Manual.
   6. It is the intent of this contract for the Contractor to provide sole responsibility for material, labor, and service for the communication cabling system. The Contractor shall, at a minimum, staff the project with BICSI certified installers for project foremen and crew leader positions.
   7. The SCC must own or have a current lease agreement for equipment to test up to Category 6a and fiber optic cable. He/she shall supply proof as required above in the submittal package, including latest calibration date.

B. At the time of bid form submission, the SCC shall submit the following information:
   1. The SCC's manufacturer certifications for:
      a. Twisted pair cabling
      b. Fiber optic cabling
      c. Connectivity
   2. The RCDD's BICSI certification. Refer to SCC's Qualifications below.
   3. A listing of the like projects within the last three (3) years. Refer to SCC's Qualifications below.

C. During the bid review, the SCC may be asked to provide any/or all of the following:
   1. A listing of the probable team members
   2. BICSI and manufacturer certifications for the installation of the Structured Cable Plant.
   3. Certifications for the installation for any firestopping required under the scope of the Structured Cable Plant installation.

D. Any/all items listed in paragraph 1.03 subparagraph B.1 or B.2, can and will be checked for authenticity and accuracy. The Owner reserves the right to reject any unauthorized or inaccurate submissions.

E. Should the SCC either fail or refuse to provide any of the items listed and/or requested in paragraph 1.03 subparagraph B.1 or B.2, the Owner reserves the right to determine the SCC as being not fully responsive and as such discard the bid in its entirety.

1.04 SUBMITTALS

A. Product Data Sheets
   1. All products
   2. Copies of all certifications

B. Shop Drawings
   1. The SCC shall submit the following shop drawings:
      a. A detailed riser diagram demonstrating the SCC's understanding of the backbone cabling.
      b. Drawings of any floor boxes with details of the various internal faceplates and their respective contents.
      c. Drawings of any through floor fittings with details of their contents.
      d. Layout drawings for cable tray and cable runway (1/16" scale minimum) based on trade coordination efforts indicating anticipated routings based on the coordination among the various trades.

PART 2 PRODUCTS

2.01 MAIN TELECOMMUNICATIONS ROOM/DEMARC (MTR)

A. The SCC shall provide plywood backboard as shown on the Drawings. If the Drawings do not indicate where or how much plywood is to be installed, Contractor shall provide, as a minimum, two (2) walls covered by 3/4-inch x 4 feet x 8 feet fire retardant plywood, painted industrial gray with two (2) coats of fire-retardant paint. Plywood shall be AC grade or better and void-free with Grade A surface exposed. To reduce warping, plywood shall be kiln-dried to a maximum moisture content of 15%.
   1. Fire retardant plywood shall be securely fastened to wall such that it can and will support equipment to be mounted. Additionally, it shall be mounted such that the 8 feet is vertical. Unless otherwise noted, bottom of plywood shall be mounted 8 inches AFF.
   2. Contractor shall cover with masking tape the "Fire Retardant" stamp on the plywood, before painting, and remove tape after painting, so that the inspector can still see the original "Fire Retardant" stamp on the plywood.
   3. Cut out plywood around all wiring devices.

B. The SCC shall provide all equipment required and/or shown on the Drawings to make MTR a safe and usable room for the Structured Cabling System.

C. For fiber optic cable entering from outside or from another TR coil, provide 30 feet of slack on re-closeable storage ring before routing cable to rack for termination in rack mounted fiber panel using LC connectors (unless otherwise noted).

D. Terminate copper station cable coming from TRs or work areas in a standard 19-inch data rack, rack mounted patch panel with 110 type punch down terminations located close to incoming protector unit.

E. Install racks, cable management, enclosures, patch panels, cables, and other equipment required in MTR as shown on Drawings. If no equipment location is indicated, coordinate rack and equipment location with Owner before installing equipment.

F. Provide MTR as shown on Drawings. Fasten cable tray to data racks.

G. Provide grounding and bonding as specified in Section 26 05 27, "Telecommunications Bonding Infrastructure."

2.02 RACKS, ENCLOSURES, AND CABLE MANAGEMENT

A. Provide a rack to fit all required equipment into enclosure.
   1. Basis-of-Design: Middle Atlantic ERK-4425-AV or equivalent by Lowell, or Atlas Sound.
      a. The equipment shall have 44 rack units and can accommodate equipment depths up to 25” deep.
      b. Fully welded construction and pre-configured for Pro AV.
      c. The rack can be assembled as a left or right hinge and open 90 degrees.
      d. Comes configured with integrated fan top, vent blockers, and rear door vent.
      e. Includes (1) lacer strip, (4) straight and (2) offset lacer bars, (12) Velcro straps, (1) PDT-2020-NS corded power strips (20A, 20 outlet), (100) 10-32 threaded rack screws.
      f. Mechanically fasten rack to floor.
      g. Provide Middle Atlantic UTR series rack shelves for all not rack mountable products and Middle Atlantic RM-LCD-MT for monitors mounted in rack.

B. Drawer
   1. Provide Middle Atlantic D2 in quantities as shown on the Drawings or equivalents by Lowell or Atlas Sound.

C. Power
   1. Middle Atlantic PD-920R-SP Rackmount Power 20A with Surge or equivalent by Lowell or SurgeX. Provide additional units if load exceeds 80% or published rating. Middle Atlantic PD-2420SC-NS Vertical Slim Power Strips as required to power all units inside rack and provide 20% spare outlet capacity for future use. Plug vertical strips into surge unit as required.

D. Horizontal Cable Management
   1. Units shall be 1U to 3U construction.
   2. Units shall be single sided.
   3. Units shall have covers that have a dual hinge technology.
   4. Access into and out of the top and bottom of the Management shall be finger type construction.
   5. Approved manufacturers:
      a. Belden
      b. Chatsworth

c. Great Lakes
d. Ortronics
e. Panduit

6. Basis of Design – 1U horizontal vertical cable manager: Chatsworth #30139-719
7. Basis of Design – 2U horizontal vertical cable manager: Chatsworth #30130-719
8. Basis of Design – 3U horizontal vertical cable manager: Chatsworth #30131-719

2.03 RACK MOUNTED SURGE SUPPRESSOR

A. For all wall-mounted enclosures less than 4 feet in height, provide horizontal rack mounted power strip with surge protection and six NEMA 5-20R outlets. Basis of design is CPI 12816-707 with equivalents by APC, Belden, Geist, Panduit, or Tripp-Lite.

B. For all other equipment racks and enclosures, provide two (2) vertical rack mounted power strip with surge protection and 14 NEMA 5-20R outlets. Basis of design is CPI 12850-706 with equivalents by APC, Belden, Geist, Panduit, or Tripp-Lite.

2.04 LIGHTNING PROTECTOR

A. Provide one Telecom Building Entrance Terminal, sized for the number of pairs entering the building, at the demark to cover incoming and outgoing connections.
1. Units shall utilize 110 blocks for both input and output.
2. Units shall comply with UL 497.
3. Units shall be powder epoxy coated.
4. Units shall utilize a five-pin socket for devices.

B. Acceptable Manufacturer and Model
1. Circa 1880ECA1 series (25, 50, 100), with C3B1S solid state protector modules.
2. Equivalent by Siemon, Panduit or Porta Systems.

C. Provide one Surge Protective Device (SPD) for each audio-video, speaker, security camera, access control, and intercom devices mounted on the exterior of the building, sized for the number of pairs, voltage, and cable type entering the building.
1. Units shall utilize connections at the equipment rack.
2. Units shall be rapid replacement type.

D. Acceptable Manufacturer and Model
1. Ditek DTK Versa-Module Series.
2. Engineer Approved Equivalent.

2.05 BACKBONE CABLING

A. The SCC shall provide all backbone cabling system as shown on the Drawings and as required to make a complete installation (both copper and fiber).

B. Outside Plant, Copper Cable
1. Approved cable manufacturers for PE 89 type, 50/100/300 multi-pair cable:
a. Superior Essex
b. General
c. Omni Cable

2. Approved cable manufacturers for Category 5e, UTP, 25 pair:
   a. Belden
   b. Mohawk
   c. Superior Essex

C. Outside Plant, Fiber Optical Cable shall be indoor/outdoor or outside plant "tight buffer" type cable. All fiber not installed in conduit must be armored or installed in inner duct.
   1. Strand count shall be as shown on the Drawings.
   2. Cable shall be single-mode and/or minimum OM3 50/125-micron multimode cable unless otherwise shown on the Drawings.
   3. Fiber must be protected from moisture with a moisture resistant jacket and a filling of water blocking material.
   4. Approved cable manufacturers:
      a. Belden
      b. BerkTek
      c. CommScope
      d. Corning
      e. Mohawk
      f. Panduit
      g. Superior Essex
      h. TCS

D. Outside Plant, coaxial cable shall be hard line cable/coax size as shown on the Drawings.
   1. Approved cable manufacturers:
      a. CommScope

E. Inside Plant, Copper Cable
   1. Approved cable manufacturers for 25/50/100 multi-pair Category 3 copper plenum cable:
      a. Belden
      b. BerkTek
      c. CommScope
      d. Mohawk
      e. Superior Essex
   2. Approved cable manufacturers for 25 PR Category 5e, UTP plenum cable:
      a. Belden
      b. BerkTek
      c. CommScope
      d. Mohawk
      e. Superior Essex

F. Inside Plant, fiber optical cable shall be tight buffer type plenum rated armored cable.
   1. Strand count shall be as shown on the Drawings.
   2. Cable shall be single-mode and/or OM3 50/125-micron multimode cable as shown on the Drawings.
   3. Approved cable manufacturers:
      a. Belden
      b. BerkTek
      c. CommScope
      d. Corning

e. Mohawk
f. Panduit
g. Superior Essex
h. TCS

G. Inside Plant, coaxial cable shall be RG11 or 0.5" hardline, size as shown on the Drawings.
1. Approved cable manufacturers:
a. Belden
b. CommScope
c. West Penn

2.06 HORIZONTAL CABLING

A. Copper Station Cabling from the TR to the work area jack shall be:
1. Category 6, UTP, 4 pair, plenum rated approved manufacturers:
a. Belden 3613
b. BerkTek LANmark 1000
c. Mohawk AdvanceNet
d. Panduit PUP6004
e. Superior Essex DataGain Cat 6+
2. Category 6a, UTP, 4 pair, plenum rated approved manufacturers:
a. Belden 10GXS13
b. BerkTek LANmark 10G2
c. Mohawk GigaLAN 10 Reduced Diameter
d. Panduit PUP6AV04
e. Superior Essex 10GainXP
3. Category 6, UTP, 4 pair, OSP rated approved manufacturers
a. Belden OSP6U 0101000
b. BerkTek LANmark 6 OSP UTP
c. Mohawk LAN-Trak 6 OSP M57622
d. Panduit PUO6C04
e. Superior Essex CMR/CMX Cat 6
4. Coaxial cable, RG11 or RG6, plenum rated approved cable manufacturers:
a. Belden
b. CommScope
c. West Penn

B. Fiber optical station cabling from the TR shall be terminated on LC connectors mounted in fiber duplex jack modules.

C. Cabling for wireless access point shall be two Category 6a cables with a 25-foot figure 8 service loop for each AP (unless otherwise noted).

D. Cabling for CCTV indoor Cameras shall be one Category 6 cable with a 10-foot figure 8 service loop for each camera (unless otherwise noted). Contractor may use a direct connect plug for the cameras, but the contractor must use a “modified single connector permanent link” test to test the cable run. The manufacturer must supply a warranty for the direct connect link. Examples: Belden REVConnect RJ45 Plug, Legrand High Performance Cat 6 RJ45 Modular Plug, Leviton Atlas X1 plus patch cord, and Panduit mini-com direct attachment plug FP6X88MTG.

E. Paging speaker cable shall be 18 AWG UTP single pair cable as shown on Drawings.
   1. Approved cable manufacturers:
      a. Belden
      b. CommScope
      c. West Penn
      d. General

F. Program speaker cable shall be 14 AWG UTP single pair cable as shown on Drawings.
   1. Approved cable manufacturers:
      a. Belden
      b. CommScope
      c. West Penn
      d. General

G. Cabling for HDBaseT video extension (or similar proprietary solutions, such as Extron DTP, Crestron DigitalMedia, etc.) applications shall be one Category 6A cable with a discontinuous shield (unless otherwise noted). Cable shall be certified by the HDBaseT alliance for HDBaseT applications. Contractor may use a direct connect plug for HDBaseT applications, but the contractor must use a "modified single connector permanent link" test to test the cable run. The manufacturer must supply a warranty for the direct connect link. Examples: Belden REVConnect RJ45 Plug, Legrand High Performance Cat 6A RJ45 Modular Plug, and Panduit mini-com direct attachment plug FP6X88MTG.
   1. Approved cable manufacturers:
      a. Belden
      b. Berktek
      c. Panduit
      d. Superior Essex

2.07 MTR CONNECTIONS

A. Patch panels for Category 6 cables shall be:
   1. Belden Category 6 KeyConnect 6+
   2. Leviton eXtreme 6+
   3. Ortronics Category 6
   4. Panduit Cat 6 PanNet

B. Patch panel for Category 6a cables shall be:
   1. Belden Category 6A KeyConnect 10GX
   2. Leviton eXtreme 6a
   3. Ortronics Category 6a
   4. Panduit Cat 6 PanNet

C. Patch panel shall be standard or modular type punchdown patch panels.

D. Fiber Patch Panels shall be LC connectors mounted in fiber duplex jack modules.
   1. Belden Fiber - FX UHD
   2. Leviton Opt-X Ultra
   3. Ortronics 1U Fiber Patch/Splice
   4. Panduit OptiCom
   5. TCS 1U Fiber Patch/Splice

2.08 CONSOLIDATION POINTS

A. Wiring blocks for consolidation points shall be 110-style by Belden, Leviton, Ortronics, or Panduit.

B. Passive, plenum-rated 2' x 2' telecommunications enclosures for consolidation points shall be Leviton Z1000-PC2 or equivalents by Belden, Ortronics, or Panduit.

2.09 WORK AREA OUTLETS

A. Work area faceplates for flush devices in interior partitions shall be stainless steel.

B. Work area faceplates for flush devices on concrete block walls shall match others but be "Jumbo" plates.

C. Work area jacks for Category 6 cables shall be:
1. Belden Category 6+ KeyConnect 6+
2. Leviton eXtreme 6+
3. Ortronics Category 6
4. Panduit CJ688TGxx

D. Work area jacks for Category 6a cables shall be:
1. Belden Category 6a KeyConnect 10GX
2. Leviton eXtreme 6a
3. Ortronics Category 6a
4. Panduit CJ688TGxx

E. Wall Phone Plate, stainless steel, single gang, one-port shall be:
1. Belden AX104230
2. Leviton eXtreme 6+
3. Ortronics Category 6
4. Panduit KWP6PY

F. Wireless 2-port surface mount box for connection shall be Leviton 41089-2WP or equivalents by Belden, Ortronics, or Panduit.

2.10 WORK AREA EXTENSIONS TO DEVICE

A. Patch Cords shall be manufactured and supplied by the manufacturer of the connectivity and shall be rated for the same performance specifications as the cabling and connectivity being utilized. These cords shall be small diameter type patch cords, 24 to 28 AWG stranded conductors.

B. Unless otherwise indicated on the Drawings, the Contractor shall provide two cables for each work area outlet data jack (one for work area outlet and one for TR) and one cable for each wall phone jack (for TR only). Of the cables provided, the Contractor shall supply 50% of the cables as 3 feet (1 meter) and 50% as 10 feet (3 meters). Refer to the Technology Drawings for any specific quantities and lengths that may override these criteria. Category 6a patch cords shall be used for category 6a connectivity.

C. Unless otherwise noted, mounting and installing of work area equipment such as computers, phones printers, etc. are not part of the SCC's scope of work under this Specification.

2.11 HANGERS AND SUPPORTS

A. J-Hooks
1. J-hooks shall be at least 1 inch hook size, minimum.
2. J-hooks shall not be over 4-inch hook size (for locations requiring 100 4-PR Category 6 cables or more, use basket tray).
3. J-hooks shall be manufactured from Spring Steel. Securable to wall, beam, threaded rod, unistrut, or pipe.
4. May utilize multi-tier configuration.
5. J-hooks shall have no sharp edges.
6. Approved J-Hook Manufacturers:
   a. Cooper B-Line J-hook
   b. ERICO, type Cable Cat 21 and 32
   c. Mag Daddy
   d. Panduit J-Pro Series
   e. Or Engineer approved equivalent

B. Threaded Rods
1. Threaded rod is to be attached to building steel in a permanent manner. Minimum size of threaded rod shall be 3/8.
2. Threaded rods are to be used for J-hook support where required.
3. When used for wire basket or cable tray support, use threaded rods with a hanger trapeze kit or unistrut to form a trapeze type support for the wire basket or cable tray.

PART 3 EXECUTION

3.01 DOCUMENTS

A. Prepare and supply documents required. See "TESTING" below.

3.02 MTR INSTALLATION

A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the MTR and cabling.

B. The SCC shall route incoming cables to proper location by means of cable tray, and/or backboard. Cable shall be routed neatly (vertical/horizontal) with some slack before termination at the proper location.

3.03 HORIZONTAL CABLING INSTALLATION

A. The SCC shall provide labor, supervision, and materials as required for a complete installation of the horizontal cabling system that includes, but is not limited to, cabling from the TR to the work area, pulling, supporting, terminating, labeling, and testing.

B. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

C. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

D. Each consolidation point (CP) shall serve a maximum of 12 work areas and shall be installed with a minimum of 25% spare terminations. No more than one CP shall be placed in each permanent link. CPs shall be located in fully accessible and permanent locations, a minimum of 50 feet from the TR or MTR.

E. When CPs are installed in a suspended ceiling or access floor space, the ceiling or floor tile locations should be clearly and permanently marked and identified as containing a CP.

F. Exception to ANSI/TIA 568-C distance limitations for horizontal category 6 cables. Extending Ethernet and POE Ethernet cabling distances beyond the 100-meter limit is permitted using Ethernet extenders for devices such as CCTV cameras, wireless access points, and IP blue light telephones. The cable must be tested to the extender manufacturer's specifications. Only use this exception where noted on the drawings.

3.04 WORK AREA INSTALLATION

A. The SCC shall provide labor, supervision, and materials as required for a complete installation of work area that includes, but is not limited to, terminating cable, placing the jacks and modules, faceplates, labeling and testing.

B. Upon completion of the project, the SCC shall clean work area and leave ready for move-in. He/she shall remove all marks, fingerprints, trash, and other debris from area.

3.05 HANGERS AND SUPPORTS INSTALLATION

A. Hangers and supports for cable tray shall be supported every 5 feet or less in accordance with ANSI/TIA-569-D. Cable tray shall be supported within 2 feet of every splice and within 2 feet on both/all sides of every intersection. Support cable tray within 2 feet on both sides of every change in elevation.

B. Threaded rod for support of hooks and/or trays shall be permanently fastened to structural steel.

C. J-hooks shall be securely fastened to wall, steel, or other structural element and spacing shall vary between 4 foot and 5 feet on center.

D. Contractor should install cable to be independently supported by approved cable tray or hanger and support products specified in this section. Avoid draping cable to be in contact and supported by other trades' products such as ductwork, sprinkler piping, plumbing, ceiling tile, etc.

3.06 WORK

A. The SCC shall furnish all materials, labor, and supervision required to install and put into service the structured cabling system specified and shown on the Drawings.

B. The SCC shall be aware that they must coordinate their work with other trades and lack of access to the job site does not relieve them of the responsibility to complete the work as scheduled.

C. The SCC shall furnish sufficient manpower and resources to finish the project when scheduled for completion. If required, the SCC will work their crew overtime to meet the completion schedule with no additional compensation.

D. All work shall be done in a professional manner; equipment installed vertical and horizontal; cables pulled neat and aligned, but allowing slack; cables bundled, but no tie wraps shall be used; use hook and loop straps loosely, do not tighten cable bundle.

E. All conduits pull boxes, junction boxes, AP enclosures, cables, jacks, modules and other devices shall be labeled.

3.07 CABLE ROUTING

A. The SCC shall avoid electromagnetic interference (EMI) by routing all structured cabling a minimum of:
1. 4 feet from 480-volt motors and transformers
2. 12 inches from electrical power distribution cables
3. 6 inches from fluorescent lighting

B. Horizontal cable shall not exceed 90 meters.

C. Conduits shall have no more than an equivalent of two (2) 90-degree bends allowed in any single run between junction boxes.

D. Cables in open or non-continuous pathways shall be routed such that the following bending radius limitations are not exceeded:
1. 4-pair UTP – minimum 4 times the overall cable diameter
2. 4-pair STP – minimum 8 times the overall cable diameter
3. Fiber Optic Cabling – minimum 20 times the overall cable diameter
4. Other Structured Cabling – refer to latest ANSI/TIA 568 Standard

E. Whenever possible, cables shall be routed from technology room into corridor and follow the corridor before branching out to the work area outlet location.

3.08 TESTING

A. The SCC shall provide a copy of the unaltered certification test reports to the Engineer in both hardcopy and electronic format. The Contractor shall also provide a copy of the associated Cable Tester's Database Management Software with unedited soft copy.

B. Upon completion of the balanced twisted-pair cable installation, the SCC shall perform copper cable certification tests on the complete channel for every cable, included but not limited to:
1. Wire map
2. Length
3. Insertion loss

4. Near End Cross Talk (NEXT)
5. Attenuation to Crosstalk Ratio – Far End (ACR-F)
6. Propagation Delay and Delay Skew
7. Return Loss
8. Power Sum Near End Cross Talk (PSNEXT)
9. Power Sum Attenuation to Crosstalk Ration – Far End (PSACR-F)
10. Insertion Loss

C. Test shall be performed to published standards, including but not limited to, the latest revisions of ANSI/TIA 568-C, ISO/IEC 11802 and other applicable standards at the time of installation.

D. All UTP/ScTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the Engineer for review prior to the start of testing.

E. All Category 6 permanent links are qualified for linear transmission performance up to 250 MHz and all Category 6a permanent links are qualified for linear transmission performance up to 500 MHz to ensure that high frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

F. Upon completion of the coaxial cable installation, the SCC shall perform cable certification tests on every cable including, but not limited to:
1. Direct current loop resistance
2. Impedance
3. Length
4. TDR
5. Noise

G. Upon completion of the fiber optic cable installation, the SCC shall perform optical time domain reflectometer (OTDR) testing and optical loss testing with a light source power meter on every cable.

H. In addition to any specific tests mentioned here, the SCC shall perform all required testing and documentation to obtain a fully certified installation from the manufacturer.

I. As may be required for extended applications warranties by the manufacturer, the manufacturer shall provide site inspection services of the installation in completed and/or in progress. The SCC shall make all necessary arrangements for such site visits.

J. Upon completion of all installation, termination and testing, the SCC shall review the entire installation with the Engineer and, at the discretion of the Owner, the Owner's authorized representative. At the time of this review, the Contractor shall present the hard copies of all unadulterated test results. The Engineer and Owner will review these test results, assess the installation, and return a written letter of acceptance to the Contractor for the Structured Cabling System.

3.09 WARRANTY

A. The SCC shall provide a minimum twenty (20) year extended Product and Applications Warranty on parts and labor from the Connectivity Manufacturers (certified Contractor Program).

END OF SECTION

SECTION 27 41 05
VIDEO MONITOR DISPLAY SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. The Contractor shall comply with Section 27 00 00, "Division 27 - Communications Introductory Statement" of Division 27 Specifications.

B. This document describes the minimum Monitor Display requirements. The Contractor shall provide the same brand of television units throughout this project regardless of picture size where possible.

1.02 SCOPE OF WORK

A. Provide a Display System as shown on the Drawings and as specified herein. Provide all accessories and equipment necessary for a complete operational system.

B. The Contractor is hereby, specifically, made aware that this work is to be completed near the end of the project. Installing the Display System ahead of schedule will subject them to the possibility of damage. It shall be the Contractor's responsibility to see that the Displays are protected and in undamaged condition when turned over to the Owner.

C. No additional compensation shall be considered or granted for "Red Overnight or Express" deliveries or for "Over/Premium Time" pay to meet the required completion schedule.

D. The Contractor shall provide a satisfactory wall mounting unit rated for the Monitor Display brand and weight.

E. The Contractor shall supply knowledgeable staff for installing, testing, programming, and adjusting the Monitor Display such that they have the picture quality/color intended and to the satisfaction of the Owner.

F. The Contractor shall supply one submittal package with all information required.

1.03 QUALITY ASSURANCE

A. All equipment shall be new, UL listed, in proper operating condition and labeled in accordance with applicable NEMA and ANSI Standards. Demo equipment will not be acceptable.

B. Audio System shall meet industry standards and professional practice.

C. Work in this section shall be performed by a Contractor who has at least three (3) years of verifiable direct experience with the devices, equipment and systems of the type and scope specified herein, who has fully staffed and equipped maintenance and repair facility, and who is licensed to perform work of this type in the project jurisdiction.

D. The contractor shall use a sufficient number of skilled workers who are thoroughly trained and experienced in the necessary crafts, who are completely familiar with the specified requirements, and the methods needed for proper performance of the work in this section. These personnel shall have at least two (2) years direct experience in similar work, evidence of which shall be verified in writing with appropriate references.

E. The Owner may request a prospective Contractor to provide additional information as desired for review by the Owner and Architect to make a determination of the Audio-Video Contractor's acceptability.

F. Other Contractors bidding this work who cannot meet the above qualifications must employ the services of a qualified Contractor who meets the above qualifications.

1.04 SUBMITTALS

A. For Review:
   1. Product data sheets of all components

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal
   2. Test results
   3. Certificate of System Completion

1.05 MANUFACTURERS/VENDORS

A. As listed below.

B. All products, whether Basis-of-Design or otherwise, shall be the most current model at time of installation.

PART 2 PRODUCTS

2.01 DISPLAY MONITORS

A. The Display Monitors shall be provided by the Contractor and shall meet or exceed the following minimum specifications:
   1. Screen Size - Diagonal from 40 to 98 inches
   2. Aspect Ratio – 16:9
   3. Resolution – 3840x2160
   4. Contrast Ratio – 5000:1
   5. All Display Monitors used for Signage shall be rated for minimum 16/7 operation.
   6. All Display Monitors shall have a minimum of (2) HDMI inputs, balanced audio output, RS-232 control port, LAN connection RJ45, and (1) USB port
   7. Refer to drawings for size and location.
   8. Contractor shall mount monitors using factory approved mounting brackets.
   9. At a minimum, the Monitor Display shall be a Commercial grade LED Monitor.
   10. Approved Manufacturers: Philips, Samsung, LG, NEC, Panasonic, or Engineer-approved equivalent

B. The Display Monitor mount shall be a thin wall mount to meet ADA requirements where necessary and tilt mounts in all other locations
   1. ADA Compliant mounts shall be satisfactory wall mounting unit rated for the Monitor Display brand and weight.
   2. The mount shall be approved by monitor manufacturer and manufactured by one of these manufacturers.
      a. Basis of Design: Chief Tempo Flat Panel Wall Mount System
      b. Peerless
      c. OmniMount
      d. Monoprice
      e. Engineer approved equivalent

2.02 DIGITAL SIGNAGE MEDIA PLAYER

A. The Digital Signage Media Player shall be a fully functional media player for delivering streaming video content and offer multi-zone layouts for looping display. The Media Player shall display Owner-generated branding and content to the mounted monitor.
   1. Digital signage player shall be provided by the owner.
      a. Connect to Monitor with HDMI cable
      b. Connect to network with Cat 6 patch cord

2.03 DISPLAY BACKBOX ENCLOSURE

A. Please refer to Section 26 05 35 Low Voltage Outlet Boxes for Monitor Displays.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install flat screen television panes where shown on the Drawings and specified.

B. Coordinate with the General Contractor that mount plates have been installed behind the sheetrock to support the weight of the television wall mount bracket and Monitor Display.

C. Mount Monitor Display on wall bracket, unit shall be permanently mounted, vertical and horizontal to floor and walls.

D. Connect all cabling in a neat and orderly fashion so they are not exposed around the edges of the display.

3.02 TESTING

A. Provide a complete functional test of all components in accordance with manufacturer's recommendations.

B. Operate system for a minimum of seven (7) consecutive days with no problems before claiming contract completion.

C. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

3.03 EQUIPMENT DEMONSTRATION

A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by manufacturer's authorized field technician.

B. Instruction shall include:
1. Location of all components of the system and explanation of their function
2. Demonstration of equipment
3. Maintenance and repair procedures
4. Programming procedures
5. Review of documents in Record and Information Manuals

C. Provide a minimum of two (2) hours training, record in digital format, and turn over to the Owner.

END OF SECTION

SECTION 27 41 30
MULTIPURPOSE ROOM AUDIO/VIDEO SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install audio/video equipment for the Event Room as shown on the Drawings and as specified herein. Provide all accessories and equipment as necessary for a complete and functioning system.
   1. The room will have audio equipment housed in the storage closet as indicated on Drawings. The projector, projection screen, monitors, and sound for this area will be controlled by a wall mounted touch screen controller.
   2. System inputs include the HDMI wall plate, wireless presentation, and wireless microphones.
   3. Provide all accessories and equipment as necessary for a complete system.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled in accordance with applicable NEMA and ANSI Standards.

B. Audio/Video systems shall meet industry standards and professional practice.

C. Work in this section shall be performed by an Audio/Visual Contractor who has at least five (5) years of verifiable direct experience with the devices, equipment and systems of the type and scope specified herein, who has fully staffed and equipped maintenance and repair facility, and who is licensed to perform work of this type in the project jurisdiction. The Audio/Visual Contractor is to have a Crestron Certified DMC-E-4K Engineer and a Crestron Certified Programmer on staff if installing Crestron equipment. The contractor will also have personnel with CTS, CTS-I and CTS-D designations applicable to their role in the project. Verification of certifications should be submitted with the bid documents.

D. The Audio/Visual Contractor shall use a sufficient number of skilled workers who are thoroughly trained and experienced in the necessary crafts, who are completely familiar with the specified requirements, and the methods needed for proper performance of the work in this section. These personnel shall have at least three (3) years direct experience in similar work, evidence of which shall be verified in writing with appropriate references.

E. The Audio/Visual Contractor shall appoint a designated supervisor who shall have at least five (5) years direct experience in similar work and/or a PMP certification. The supervisor shall be present and in responsible charge of all work in the fabrication shop, on the job site during all phases of the installation, and testing of the system(s). This supervisor shall be the same individual throughout the execution of the work unless illness, loss of personnel, or other reasonable circumstances intervene.

F. The Owner may request a prospective Audio-Visual Contractor to provide additional information as desired for review by the Owner and Architect to make a determination of the Audio-Visual Contractor’s acceptability.

G. Other contractors bidding this work who cannot meet the above qualifications must employ the services of a qualified Audio/Visual Contractor who meets the above qualifications. This Audio/Visual Contractor shall supervise the installation and perform all wiring connections.

1.03 SUBMITTALS

A. For Review: Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Drawings shall be prepared and submitted on 30-inch x 42-inch paper. Equipment lists, data sheets, etc. shall be 8 1/2-inch x 11-inch size, properly bound into a single or multiple volumes. Include the following:
   1. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.
   2. Manufacturer's data sheets on all equipment items.
   3. System block diagram(s).
   4. Equipment rack layouts showing all rack mounted equipment items.
   5. Floor plans, prepared at a scale of not less than 1/8" = 1'-0", showing loudspeaker locations and orientation, wall plates, and all other related device locations.
   6. Proposed construction details for all custom fabricated items, including interface panels, patch panels, and wall plates. These details shall show dimensions, materials, finishes and color selection.
   7. Riser diagrams showing conduit requirements with pull boxes, outlet boxes, part numbers of cable types used, and number of circuits in each conduit.
   8. Electrical power requirements for head-end and ancillary equipment. Include diagrams for any remote control of electrical power, in sufficient detail to coordinate with Division 26.

B. To be included in Record and Information Manuals:
   1. One (1) copy of each approved submittal.
   2. Certificate of System Completion.
   3. Certificate Equipment Receipt.
   4. One (1) copy (data and printed) of the complete Control Program.

1.04 OPERATION

A. The video from the HDMI wall plate or wireless presentation shall be sent to projector and wall-mounted side monitors for viewing. Audio from the wireless presentation, HDMI wall plate, and/or wireless microphones shall be mixed, equalized, amplified, and played over the pendant ceiling speakers in the room, courtyard speakers and/or pre-function corridor speakers. A touch screen control panel for the room shall allow selection of audio/video source, adjust audio levels, raise/lower the projection screen. Hearing assistance audio shall be via a Portable Assistive Listening System.

1.05 MANUFACTURERS/VENDORS

A. See below.

B. All products, whether Basis-of-Design or otherwise, shall be the most current model at time of installation.

PART 2 PRODUCTS

2.01 PROJECTOR

A. Configuration to be determined. See architectural drawings for additional information.

2.02 PROJECTION SCREEN

A. Configuration to be determined. See architectural drawings for additional information.

2.03 DISPLAYS

A. See Section 27 41 05 Video Monitor Display for monitor details.

2.04 AUDIO/VIDEO RACK AND ACCESSORIES

A. Please see 27 10 00 Structured Cabling Specification.

2.05 WIRELESS PRESENTATION

A. Provide wireless presentation device as an input in each classroom monitor.
   1. Basis-of-Design: Crestron AM-3200-WF or equivalents by Extron, or Engineer approved equal.
      a. Supports up to 4K resolution at 30Hz output
      b. Includes an HDMI input for direct connection of a local source
      c. Provides an HDMI input, dual LAN, balanced audio output, and display control via RS-232 and IR.
      d. Wi-Fi 802.11ac (2.4GHz/5GHz)
      e. HDMI Output

2.06 HDMI TRANSMITER (ENCODER)

A. Provide HDMI Transmitter where indicated on Drawings.
   1. Basis of Design: Just Add Power VBS-HDIP-707POE or equivalents by Crestron, Extron, QSC, or Engineer approved equal.

B. Provide HDMI Wall Mounted Transmitter where indicated on Drawings.
   1. Basis of Design: Just Add Power VBS-HDIP-707WP2 or equivalents by Crestron, Extron, QSC, or Engineer approved equal.

2.07 HDMI RECIEVER (DECODER)

A. Provide HDMI Receiver where indicated on Drawings.
   1. Basis of Design: Just Add Power VBS-HDIP-508POE or equivalents by Crestron, Extron, QSC, or Engineer approved equal.

2.08 STEREO TRANSCEIVER

A. Provide Stereo Transceiver where indicated on Drawings.
   1. Basis of Design: Just Add Power VBS-HDIP-ST1 or equivalents by Crestron, Extron, QSC, or Engineer approved equal.

2.09 NETWORK I/O EXPANDER

A. Provide QSC QIO Network Audio I/O Expanders Mounted in QIO-RMK rack mounting kit with QIO-PSU DC power supply where indicated on Drawings.
   1. Provide Network I/O Expander where indicated on Drawings.
      a. Basis of Design: QSC ML4i or equivalents by Crestron, Extron, or Engineer approved equal.
   2. Provide Network I/O Expander where indicated on Drawings.
      a. Basis of Design: QSC L4o or equivalents by Crestron, Extron, or Engineer approved equal.
   3. Provide Network I/O Expander where indicated on Drawings.
      a. Basis of Design: QSC GP8X8 or equivalents by Crestron, Extron, or Engineer approved equal.
   4. Provide Network I/O Expander where indicated on Drawings.
      a. Basis of Design: QSC QIO-ML2X2 or equivalents by Crestron, Extron, or Engineer approved equal.

2.10 TOUCH SCREEN CONTROLLER

A. Provide a seven (7) inch touch screen controller where indicated on Drawings.
   1. Basis of Design: QSC TSC-70-G3 or equivalents by Crestron, or Engineer approved equal.

2.11 WIRELESS MICROPHONE

A. Provide Wireless Handheld Microphone where indicated on Drawings.
   1. Basis of Design: Audio Technica ATW-1312/L or equivalents by Shure, Sennheiser, or Engineer approved equal.

2.12 AUDIO VIDEO NETWORK SWITCH

A. Provide Network Switch for local control signal transport only where indicated on Drawings. Do not connect to Owner Enterprise Network.
   1. Basis of Design: Netgear M4250 series or equivalents by Cisco, Luxul, Extreme, or Engineer-approved alternative.
      a. Provide sufficient network ports to support all connected devices plus 20 percent spare capacity.
      b. Provide support for all PoE budget requirements of all connected devices plus 20 percent spare capacity.

2.13 AUDIO

A. Digital Signal Processor (DSP) and System Controller
   1. Provide an audio DSP to fill all I/O requirements as indicated on Drawings.
      a. Basis of Design: QSC Core Nano or equivalents by Biamp, Ashly, or Engineer-approved equivalent
         1) Sufficient quantity of networked Mic/Line inputs as indicated on Drawings.
         2) Unit shall have IP and/or RS-232 control and fully integrated controls to control system.
         3) Frequency Response: 20Hz-20kHz

4) Sufficient quantity of networked analog audio outputs.
5) Supports integrated networked system controller.
6) Supports standard digital signal processing features, including, but not limited to, compressors, gates, parametric and/or graphic equalizers, delays, and auto-mixers.

B. Amplifier
1. Provide an audio amplifier with sufficient outputs and power capacity to accommodate all speakers and zones as indicated on Drawings.
   a. Basis of Design: QSC MP-A40V or equivalents by Powersoft, Lab Gruppen, or Engineer-approved equivalent.
      1) Sufficient quantity of inputs and amplified outputs as indicated on Drawings.
      2) Frequency Response: 20Hz-20kHz
      3) THD < 1%

C. Speakers
1. Provide Pendant Speakers in the ceiling throughout the spaces as indicated on Drawings. Align speakers within the area closely coordinated with other systems on the ceiling including the lighting and HVAC systems.
   a. Basis-of-Design: JBL Control 67 HC/T pendant ceiling speakers with all required components and quantities as shown on the Drawings
      1) The ceiling speaker system shall consist of a 165 mm (6½ in) woofer and 25 mm (1 in) soft-dome tweeter
      2) The suspension system shall consist of one as main suspension cable and the other as safety cable, each consisting of 4.5 m (15 ft) long 2 mm (0.077 in) high-tensile galvanized-steel wire rope suspension cable with spring-clips for clipping onto the loudspeaker bracket and Gripple brand adjustable-height cable fasteners for infinitely adjustable height. Cables have SWL rating of 45 kg (99 lb.).
      3) The system shall have a conical coverage pattern of 75° coverage for excellent clarity in high-ceiling and reverberant locations. Frequency response measured on axis shall be 75 Hz - 17 kHz (-10 dB from rated sensitivity). Sensitivity shall be 93 dB (1W @ 1m). Long term power handling capacity shall be 75 watts.
      4) Speaker color shall be black.
      5) Provide required ceiling mounting brackets.
      6) Tap speakers at 70 volts, 30 watts each.

2. Provide Surface Mounted Speakers in Corridor 202 as indicated on Drawings. Align speakers within the area closely coordinated with other systems on the ceiling including the lighting and HVAC systems.
   a. Basis-of-Design: JBL Control 23-1surface mounted speakers with all required components and quantities as shown on the Drawings.
      1) The surface mounted speaker system shall consist of a 3” woofer with woven fiberglass cone woofer and 1/2” PEI diaphragm tweeter with fluid cooling.
      2) Built-in InvisiBall mounting hardware, plus available U-bracket.
      3) 70 Hz – 20 kHz bandwidth with wide 100° x 100° coverage.
      4) Built-in 15-Watt 70V/100V multi-tap transformer.
      5) Speaker color shall match mounting surface.
      6) Weather resistant enclosure and transducers.

7) Provide required mounting brackets.

3. Provide Surface Mounted Speakers in the Courtyard as indicated on Drawings. Align speakers within the area closely coordinated with other systems on the ceiling including the lighting and HVAC systems.
   a. Basis-of-Design: JBL Control 25AV surface mounted speakers with all required components and quantities as shown on the Drawings.
      1) The surface mounted speaker system shall consist of a 5.25" polypropylene coated woofer and 3/4" titanium coated horn loaded tweeter.
      2) Built-in InvisiBall mounting hardware, plus available U-bracket.
      3) 70 Hz – 23 kHz bandwidth with wide 100° x 100° coverage.
      4) Built-in 60-Watt 70V/100V multi-tap transformer.
      5) Speaker color shall match mounting surface.
      6) Weather resistant enclosure and transducers.
      7) Provide required mounting brackets.
      8) Provide JBL MTC-xxWMG WeatherMax Stainless Steel Grill.

4. Provide Ceiling Mounted Speakers in the restrooms and dressing room as indicated on Drawings. Align speakers within the area closely coordinated with other systems on the ceiling including the lighting and HVAC systems.
   a. Basis-of-Design: JBL Control 14C/T ceiling speakers with all required components and quantities as shown on the Drawings
      1) The ceiling speaker system shall consist of a 100 mm (4.0 in) high output driver with polypropylene cone and butyl rubber surround woofer and 19 mm (0.75 in) soft-dome liquid-cooled tweeter.
      2) Blind-mount back can for quick and easy install.
      3) 74 Hz – 20 kHz bandwidth with wide 120° coverage.
      4) Speaker color shall match ceiling color.
      5) Provide required ceiling mounting brackets.

D. Portable Assisted Listening System
   1. Provide a wireless transmitting system to meet the ADA requirements for assisted listening inside the space.
      a. Basis of Design: Listen Technology LS-88-01 or equivalents by Williams Sound, or Engineer approved alternate.
      b. Provide at least four (4) compatible receivers with headphones and neck loops per system. Final receiver counts to be determined by ADA requirements.
      c. The receiver shall have a 3.5 mm stereo/mono jack to accommodate stereo or mono low impedance earphones, headphones, and neck loops.
      d. Provide charging station for receivers.
      e. Provide proper signage for spaces equipped with ADA-compliant assistive listening in owner-specified location.

2.14 WIRE AND PATCH CABLES

A. SPKR - Speaker cable shall be plenum 16 AWG UTP single pair cable as required on Drawings. West Penn 25225B.

B. AUDIO - Microphone cable shall be plenum (1) pair 22 AWG STP as required on Drawings. Basis of Design: West Penn 25291B

C. CTRL - Low voltage control cable shall be plenum 4 conductor 22 AWG (2) shielded, (2) unshielded twisted pair as required on Drawings. Basis of Design: West Penn 25357B

D. HDMI - Provide HDMI patch cables which meet the latest standards and support of 1080p, 3D, 4Kx2K, Deep Color, Dolby TrueHD, DTS HD-Master, Audio Return Channel and Ethernet.

E. COAX - Provide RG6 and RG213 as required on Drawings. Basis of Design: West Penn 25806 and West Penn 25810

F. CAT6 - Provide factory terminated Cat 6 patch cables with lengths as required.

G. DTP - Provide video cabling per Extron recommendations as required on Drawings.

H. Provide minimum 10-foot patch cables for all input plates to connect Owner's equipment.

I. Provide a decora microphone plate as required on Drawings similar to Radio Design Labs DB-XLR3M.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install video equipment and cable as shown on the Drawings in accordance with manufacturer's written instructions.

B. Mount displays, speakers, and other equipment in accordance with manufacturer's written instructions. For all equipment mounting, use bolts of Grade 5 or better.

C. Mount audio/video wall plates and touch screen controller in locations indicated on Drawings. Coordinate wall plate and button/knob finishes with Architect and Owner on a per room basis.

D. A pre-installation meeting with the Owner's Representative must be scheduled prior to the installation of system components. At this meeting, the integrator shall present a storyboard of the programming of all touch panels to ensure the Owner approves of the touch panels changes. Once the programming storyboard is approved, the Owner will provide a sign off on the proposed programming layout.

E. Provide, at no charge to the Owner, a sufficient number of hours of programming to ensure simple, intuitive, and efficient A/V system and control operation and match other Owner control deployments.

3.02 TESTING

A. Provide a complete functional test of all components in accordance with manufacturer's recommendations.

B. For all projection systems, ensure minimum of 15:1 system contrast ratio under normal operating conditions.

C. Ensure that audio systems provide coverage at listener plane of within +/- 3 dB across entire listener area at 75 dB SPL with a pink noise signal generator and flat response microphone.

D. Equalization
   1. Measure system acoustical performance using a calibrated sound level meter set for "slow" meter damping and flat response with random incidence at a height of 4 feet to 5 feet. All interior furnishings shall be in place and system gain shall be adjusted to provide levels of 70 dB to 80 dB and at least 10 dB above ambient noise levels at the measuring locations.
   2. Using a precision calibrated 1/3 octave audio frequency analyzer and filtered pink noise, with all control equalization set for flat response, measure, and record loudspeaker frequency response in 1/3 octave bands. Measurement microphone shall be placed on-axis to the pertinent speaker, in the center of each seating area.
   3. Adjust equalization to provide average system response within ±3 dB of a response curve that is flat from 300 Hz to 3,000 Hz, then sloped uniformly to 4 dB at 12 kHz. Record both equalizer settings and analyzer curves.

E. Should the performance testing show that the Contractor has not properly completed the systems, the Contractor shall make all necessary corrections or adjustments, and a second demonstration shall be arranged at the Contractor's expense.

F. Operate system for a minimum of seven (7) consecutive days with no problems before claiming contract completion.

3.03 WARRANTY

A. Warranty against defects in material and workmanship in the mounting and the interconnection of permanently installed equipment. This workmanship integration warranty shall be valid for one (1) year. The warranty begins on the date of the Owner's acceptance of system completion. The integrator shall cover the expense of removing, shipping, or re-installing serviced equipment. Warranty service provided by the manufacturer for parts and labor is typically performed at the manufacturer's facility. Damage proven to be caused by natural phenomenon, such as flooding, fire, tornado, earthquake, unstable atmospheric conditions, will not be required. This warranty shall not cover consumable items such as batteries or lamps; these are normal use items, which are to be replaced by the customer as needed.

B. The integrator will honor all manufacturer's warranty terms extending beyond the duration of the first year. The integrator will provide all warranty service and pass the cost of shipping and handling, etc. directly through to the Owner. This additional labor beyond one (1) year will not be covered and will be negotiated between the Owner/Integrator.

3.04 EQUIPMENT DEMONSTRATION

A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by manufacturer's authorized field technician. All training sessions shall be recorded and electronically turned over with O&M manuals.

B. Eight (8) hours of training shall be for general users of the system and may be broken up into multiple sessions as coordinated throughout the construction team and Owner. Training shall include a detailed instruction booklet of basic usage of the system. This booklet shall include detailed instructions and photographs of actual touch panel screen shots and field mounted equipment. Provide enough documentation for all attendees and leave spare manuals in the rack storage drawer.

C. Eight (8) hours of detailed training for technical staff which is dedicated to technical staff usage and cover common maintenance items and thorough explanation of the system functionality. At this time, a copy of half size drawings shall be turned over to the Owner directly as well as an electronic copy of the O&M Manuals and PDF Drawings. Instruction shall include:
   1. Location of all components of the system and explanation of their function
   2. Demonstration of equipment
   3. Maintenance and repair procedures
   4. Programming procedures
   5. Review of documents in Record and Information Manuals

D. Perform a one-year follow-up preventive maintenance call. At this time, the integrator will do the following:
   1. Full functional checkout of the entire system
   2. Recalibration of all audio levels
   3. Software and firmware upgrades as required by manufacture and then fully test all system components and controls
   4. Verify all touch panels controls are still working as originally installed.
   5. Assist with questions and provide up to a half day of additional training for new users.

E. Provide additional programing changes as required by break/fix issues in the programing interacting with system components within two business days of service call. Provide one (1) additional follow up meeting with the Owner's Representative for cosmetic and flow changes to the programming as requested by the Owner.

END OF SECTION

SECTION 28 00 00
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY INTRODUCTORY STATEMENT

PART 1 GENERAL

1.01 REQUIREMENTS

A. All work included under this heading is subject to the Bidding Requirements, the Instructions to Bidders, the General Conditions, and/or the Division 1 General Requirements written for this entire Specification and shall apply to all work herein.

B. In addition to conforming to the documents listed in Paragraph 1.01 A. above, the work performed by the Division 28 Contractor shall conform to all provisions of Sections 28 00 00 through 28 99 99 as included and made part of this Specification. The Division 28 Contractor is to consider the word "Contractor" when used in these Sections to mean himself/herself.

C. The Division 28 Contractor must read the Specifications of all divisions, because they will be responsible for any and all work described in other Sections where reference is made to Division 28 and/or Electronic Safety and Security Contractor.

1.02 APPLICABLE SECTIONS

A. Division 28 Contractor shall perform work described in the preceding paragraphs, and as it relates to Division 28 work in the following Sections (as included):

26 05 27	Telecommunications Bonding Infrastructure
27 00 00	Communications Introductory Statement
26 07 12	Security System Raceways
27 10 00	Structured Cabling

B. Where reference is made to the Division 27 Contractor in the above applicable Division 27 Specification Sections, it shall be construed to mean Division 28 Contractor.

1.03 RESPONSIBILITY

A. The Engineer's efforts under this Contract are aimed at designing a project that will be safe during construction and after full completion of the project. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed must not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

B. If a conflict occurs between the Drawings and/or the Specifications, immediately call the conflict to the attention of the Architect at least ten (10) days before bids are submitted, so an addendum clarification may be issued. Conflicts not brought to the Architect's attention before bids are due, shall be priced by the Contractor to include the most expensive, highest quality and quantity of the conflicting items in question.

END OF SECTION

SECTION 28 00 15
SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

A. Refer to the GENERAL CONDITIONS and Division 1 for general requirements.

B. Materials and equipment installed in this work shall meet all the requirements of the Contract Documents and no materials or equipment shall be ordered until submittals are reviewed and approved by the Architect and Engineer.

C. Submit complete catalog data or shop drawings for each manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, dimensional data, material gauge or thickness, wiring diagrams, brand name, catalog number, and general type.

D. Catalog data for equipment reviewed by the Engineer shall not take precedence over the requirements of the Contract Documents. The review of the Engineer shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Trades.

E. When submitted for review, all shop drawings shall bear the Contractor's signed certification that he/she has reviewed, checked, and approved the shop drawings, that they have been coordinated with the requirements of the project and with the provisions of the Contract Documents, and that he/she has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. Annotations shall be in red ink.

F. Each required Specification Section submittal shall be complete with all required information included in one PDF file. External web links are not permitted. Include a transmittal cover page indicating Specification Section name and number.

G. Submittals shall be sent to shopdrawings@korda.com.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Complete review of shop drawings, product data, and samples prior to submission.

B. Determine and verify:
1. Field Measurements
2. Field Construction Criteria
3. Catalog Numbers and Similar Data
4. Conformance with Specifications

C. Coordinate each submittal with requirements of the work and the Contract Documents.

D. Include a letter in the front of the submittal of any deviations in the submittals from the requirements of the Contract Documents.

E. Make submittals and resubmittals, if necessary, promptly in accordance with the approved schedule and in such sequence as to cause no delay in the work or in the work of any other Contractor, or the project as a whole.

F. Make any corrections or changes in rejected submittals as required by the Architect and resubmit until approved.

G. Begin no fabrication or work which requires submittals until approved submittals are returned.

1.03 INCORPORATION OF SUBMITTALS INTO RECORD AND INFORMATION MANUALS

A. Refer to Section 28 00 20, "Record and Information Manuals."

1.04 CERTIFICATIONS

A. Provide:
1. Test Agency results verifying capacities, operating conditions and power requirements at design conditions
2. Manufacturer's Statement of Compliance with Standards discussed in individual Specification Sections
3. Equipment labels indicating Certification requirements
4. Quality standard designations on each unit piece
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with
6. Other Certifications listed in other Sections of the Specifications

1.05 REQUIRED SUBMITTAL INFORMATION

A. Submittal Transmittal
1. Provide the following information on the Transmittal Form for each submittal:
   a. Project name and address.
   b. Specification number, as listed for each submittal item required in Paragraph 1.05C below.
   c. Item description, as listed for each submittal item required in Paragraph 1.05C below. Where equipment is identified by number or tag on the documents, same shall be indicated on the submittal.
   d. Specification number and item description (b and c, above) for each submittal if more than one submittal is sent under one transmittal form.
   e. Name, address and telephone number of Contractor.
   f. Bid package number (if applicable).
2. Submittal Transmittal Forms not properly identified with the above information will be returned (without review) to the Contractor.

B. Refer to the following letter key:

KEY FOR REQUIRED SUBMITTALS:
A. Shop Drawings and/or Layout Drawings
B. Product Data Sheets
C. Wiring Diagrams

D. Installation, Operation, and Maintenance Instructions (Due at the end of project)
E. Reports or Test results (Due at the end of project)

C. Submit information on equipment items as listed below.

SECTION #	CONTRACT ITEM	SUBMITTALS REQUIRED
28 00 20	RECORD AND INFORMATION MANUALS	A, B, C, D
28 23 00	VIDEO SURVEILLANCE SYSTEM	B, C, D

D. After approval, one (1) copy shall be returned to the Contractor. Contractor shall make prints of the approved transparencies and reproductions of all other shop drawing information as necessary for his/her use and for inclusion in the Record and Information Manuals.

END OF SECTION

SECTION 28 00 20
RECORD AND INFORMATION MANUALS

PART 1 GENERAL

1.01 RECORD DRAWINGS

A. Refer to Division 1 for general requirements as well as for specific information regarding Record (As-Built) Drawings. All drawings shall be provided in electronic PDF format.

1.02 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 for general requirements and for specific information regarding Operation and Maintenance Manuals, including required format(s) (paper and/or electronic) and quantity. If no such requirements are listed in Division 1, provide in electronic format. Submit one (1) copy of draft manual to the Architect for review and approval thirty (30) days before final inspection is due. After approval, submit three (3) approved manuals to the Owner and obtain receipt. (See Section 26 00 99, "Requirements for Contract Completion.")

B. Paper Copy Manuals shall be loose leaf, three-ring, heavy-duty hard-cover binders. Material shall be typewritten or printed and be fully legible. Each section shall be divided by labeled tabs.

C. Electronic Copy Manuals shall be PDF file format. Individual documents shall have filenames corresponding to specification sections and system names. Each document shall have bookmarks corresponding to the systems, subsystems, and equipment names. Use electronic files prepared by manufacturers where available.

D. The following items, together with any other necessary pertinent data, shall be included in each Manual:
   1. Each manual shall be labeled on front cover with project name, Contract, Contractor's name, Architect, Engineer, and date of project completion.
   2. Manufacturers' names, nearest Factory Representative, and model and serial numbers of components of systems
   3. Operating instructions, start-up and shutdown procedures
   4. Maintenance instructions
   5. Routine and 24 hour emergency service/repair information:
      a. Name, address, and telephone number of servicing agency
      b. Names of personnel to be contacted for service arrangements
   6. Parts list with numbers of replaceable items, including sources of supply
   7. Manufacturers' literature describing each piece of equipment
   8. One (1) approved copy of each submittal
   9. Written warranties
   10. Certificate of Material Receipt and Certificate of System Completion
   11. Record (As-Built) Drawings
   12. IP and MAC address identified for each item required to have an address

13. Certificate of Final Inspection signed by Building Authority Having Jurisdiction
14. Test results
15. Video recordings of all equipment demonstrations and training sessions

END OF SECTION

SECTION 28 23 00
VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish and install a complete IP Video Surveillance System as shown on the Drawings and as specified herein. Provide all accessories and equipment as necessary for a complete system.

B. The Surveillance System shall utilize IP-based cameras to monitor the internal and external areas of the facility. The activity shall be recorded onto a network video recorder (NVR) that will be connected to the Owner's network. Viewing and/or control shall occur by means of a software client loaded onto assigned PC's. Viewing only shall be capable by means of a web-based interface, and/or by means of smartphones and tablets utilizing both Apple iOS and/or Android operating systems.

1.02 QUALITY ASSURANCE

A. All equipment shall be UL listed and labeled and in accordance with applicable NEMA and ANSI Standards.

B. Contractor shall be certified with the equipment manufacturer that is being installed.

1.03 SUBMITTALS

A. For Review:
1. Product data sheets of all components
2. Wiring Diagrams
3. Schematic Block diagrams
4. Network bandwidth calculation
5. Digital video storage calculation
6. Copies of all certifications

B. To be included in Record and Information Manuals:
1. One (1) copy of each approved submittal
2. Test results
3. Certificate of System Completion

1.04 MANUFACTURERS

A. As listed within. Basis of design listed is intended to meet the minimum requirements. Other acceptable manufacturers are as noted.

PART 2 PRODUCTS

2.01 IP CAMERA SYSTEM

A. The system shall be a complete IP based video surveillance system that shall utilize the Owner's network as the method of transport to a video surveillance server that shall record and retain the video and provide an export capability to transfer files that the Owner wishes to record to their choice of media.

B. Cameras
1. All Cameras shall utilize Internet Protocol as the transport for the video signaling.
2. Housing color for all exterior pole-mounted cameras (including any attached mount and box) shall be painted by the manufacturer to match the lighting pole color.
3. The cameras shall meet or exceed the following performance requirements and criteria.
4. 2MP Varifocal Indoor Dome Camera:
   a. Image Sensor: 1/2.8" 2MP CMOS
   b. Lens: 3.2 ~ 10mm (3.1x) motorized varifocal
   c. Horizontal Angle of View: 109.0˚(Wide) ~ 33.2˚(Tele)
   d. Vertical Angle of View: 57.4˚(Wide) ~ 18.7˚(Tele)
   e. Compression: H.265/H.264, MJPEG
   f. Resolution: 1920x1080 2MP
   g. Day & Night: Auto (ICR)
   h. Network: 10BASE-T / 100BASE-TX (RJ-45)
   i. PoE: IEEE802.3af compliant
   j. Vandal Resistant: No
   k. Basis of Design: Hanwha Techwin QND-6082R
5. 2MP Varifocal Outdoor Dome Camera:
   a. Image Sensor: 1/2.8" 2MP CMOS
   b. Lens: 3.2 ~ 10mm (3.1x) motorized varifocal
   c. Horizontal Angle of View: 109.0˚(Wide) ~ 33.2˚(Tele)
   d. Vertical Angle of View: 57.4˚(Wide) ~ 18.7˚(Tele)
   e. Compression: H.265/H.264, MJPEG
   f. Resolution: 1920x1080 2MP
   g. Day & Night: Auto (ICR)
   h. Network: 10BASE-T / 100BASE-TX (RJ-45)
   i. PoE: IEEE802.3af compliant
   j. Vandal Resistant: Yes, IK10
   k. Environmental: IP66 rated for outdoor use
   l. Basis of Design: Hanwha Techwin QNV-6082R
6. Equivalents by Axis, Avigilon and Bosch / Sony
7. Provide enclosures and appropriate mounting bracket for each camera provided based on the location and environment of the installation location. Refer to drawings for camera mounting details and schedule. All exterior wall mount cameras shall be installed with an exterior low profile wall mount kit such that the camera is horizontally mounted (not vertically mounted on the wall). For exterior ceiling mount camera locations where installed on a gable or sloped ceiling, ensure that camera view will be level to the ground by either (a) rotating the camera lens or (b) providing an appropriate pitched mount bracket to compensate for the slope.
   a. Corner mounted basis of design: Hanwha SBP-300KMS with SBP-137WMW1

C. Video Management Software (VMS)
1. The VMS shall manage video and event data received from cameras connected to multiple recording servers, as well as from physical security, content analytic, environmental detection, transaction and other enterprise systems.
2. The VMS shall allow the integration of a host of add-on components via integration tools including data link integration events, API commands, contact closure and more.
3. The VMS shall run on off-the-shelf PC hardware and support all leading manufacturers' cameras and devices (over 1500 models), as well as all industry standard compression formats (MPEG4, MJPEG, H.263, H.264 and H.265)
4. The VMS system resources shall be optimized through per camera configuration for compression level/format, image resolution, bandwidth, frame rate, conditional recording, retention time, archiving frequency, archiving location and more.
5. The VMS shall operate so all recording servers and client users are managed by the base, which coordinates all event and alert handling, manages users' rights to specific cameras and functions system wide (Active Directory supported), and distributes all shared assets
6. The VMS shall function so storage, based on either size or retention period, is allocated per camera or camera group, with prioritization of important cameras. Video can be stored on local or network drives, using a database structure that eliminates the distinction between 'live recording' and 'archived' video.
7. The VMS shall have a system-wide repository for shared assets management, including maps for easy navigation to cameras, icons and events tagging/classification tables.
8. The VMS shall provide free client software capable of operating on Windows, Linux, or Mac and have the following additional features:
    a. Event Management
    b. Event Prioritization
    c. Composite Events (linking events or alerts)
    d. Push video alerting
    e. Management of Users, User Groups and Authorizations
9. The VMS server software shall provide the following features as a minimum:
    a. System
        1) One server connection per client
        2) Browser-based viewing of live and stored video
        3) Auto detection of supported cameras
        4) Support for fish-eye and panoramic lens cameras
        5) Client bandwidth throttling
        6) Soft triggers
        7) Pre and post alarm recording
        8) Continuous motion, time or alarm-based recording, configurable per camera
10. The VMS shall be capable of providing the following Actions on an event:
    a. Send email notification to one or more recipients
    b. Move PTZ camera to preset
    c. Send HTTP GET/POST request
    d. Send TCP/UDP package
    e. Send event camera(s) to remote Video wall
11. The VMS shall support the recording, viewing, archiving, and configuring of at least the camera manufacturer that is chosen.
12. The VMS shall support access for mobile devises (Smartphone, touch pads etc.) with proper authentication.
13. The contractor shall provide, if not existing, a base server with the latest requirements recommended by the manufacture.

14. Acceptable Manufacturer and Product shall be:
    a. Exacq
    b. Genetec
    c. Milestone
    d. OnSSI
    e. Salient
    f. Avigilon
    g. Engineer-approved equivalent

D. Network Video Recorder Hardware (NVR)
1. The NVR shall be a rack mounted unit capable of being installed in an EIA standard 19" rack without the use of custom mounting hardware with the exception of commercial, off the shelf, rack mount hardware from the NVR server manufacturer. Each NVR shall have Scalable Architecture with unlimited number of cameras, connected to multiple recording servers (up to 64 cameras per server) at multiple sites; support for MJPEG, MPEG4, H.263 and H.264 compression formats, at image resolutions up to 5MP (and higher) and frame rates of 30 fps or more; support for analog cameras via a wide range of IP video encoders.
2. The Network Video Recorder ("NVR") shall be an appliance to acquire, record, store, and display video signals from both directly connected analog cameras and IP network video cameras and encoders.
3. Each NVR shall be configured via an administration utility for setup and configuration of cameras and I/O devices, camera event settings, archive settings, scheduling, and soft buttons for manually triggered events.
4. Each NVR shall automatically discover and detect cameras and other devices based on user preferences and have the following other features
    a. Batch Device Configuration
    b. Export/import of configuration data
    c. Set automatic system restore points
    d. Recording and Archiving
    e. Maintenance-Free, Transparent Archiving
    f. Multi/dual-stream support
    g. Support for DNS and NAT (Network Address Translation.)
    h. PTZ Preset Settings
    i. PTZ Patrols
    j. Two way audio
    k. Networking: Support for Multi-Network operation
    l. Detailed logging
    m. Advanced Motion Detection with three resolution levels of motion detection.
5. Each NVR shall have no limit on the number of concurrent client users, and no incremental cost for additional Clients.
6. Each NVR shall support up to eight connected displays.
7. The NVR shall be configured with RAID-5 storage. The RAID-5 storage shall be internal to the server and shall provide notification of a drive failure to the administrator.
8. The NVR shall be sized to accommodate all new cameras as well as 30% spare capacity. Assume 70% motion for all cameras. Cameras to record substream at all times at full frame rate and low resolution. Cameras to record mainstream on motion detection at 15 fps and full resolution. Size for 30 days of storage.

9. In addition to the previously declared requirements of the NVR, it must meet all specifications set by the manufacturer.
10. Acceptable Manufacturer shall be VMS/Camera Manufacturer Recommended Product

E. Keyboard/Video/Mouse (KVM)
1. The unit shall be 1U high and mount in a standard EIA 19" rack mount enclosure or rack.
2. The unit shall be compatible with all current versions of the Microsoft Windows operating system.
3. The unit shall provide inputs compatible with the computers specified for the NVR servers.
4. The unit monitor shall be:
   a. Size: 19" diagonal
   b. Video Input: Digital
5. Basis for Design: Tripp Lite KVM Rack Console w/ 19" LCD in 1URM Steel Drawer with Cable Kit. Equivalents by StarTech, Belkin and Middle Atlantic

F. Administrative Client PC
1. If not supplied by owner, provide a client PC for the security system headend for remote viewing of security cameras as indicated on Drawings. Specifications must meet or exceed the VMS manufactures specifications for a client PC.

G. Ethernet Extender
1. Ethernet Extenders lengthens the distance beyond the 328 feet limitation and under 700 feet. Extends both Ethernet and PoE.
   a. Requires two units. One on the transmit end and another at the camera.
      1) Eight port Transmit chassis basis of design: Vigitron Vi2308
      2) Single port Receiver basis of design: Vigitron Vi2301
2. Equivalents by: ComNet or Veracity.

H. Poe Ethernet Switch
1. Ethernet Switch shall support the transmission of 10/100/1000 Mbps with 30 watts PoE over unshielded twisted pair. The switch shall be capable of supporting IEEE 802.3at 30Watt PoE at every port simultaneously with a fully internal power supply.
   a. The switch shall have a minimum of 24 UTP POE switch ports.
   b. The switch shall have 2-Port Gigabit Uplink Ports.
   c. The switch shall require no in-field electrical or optical adjustments or in-line attenuators to ease installation.
2. Acceptable Manufacturers: ComNet, GeoVision, or Vigitron.

I. Media Converter and Power Injector
1. Media Converter with Integral Power, for the head end, provides four (4) 1Gb SFP ports and four (4) ports for up to 120W per port (480W total) to be transmitted over single/multi-mode fiber or composite cable (powered) cable (fiber + copper combined)
   a. The unit shall have 4-Port Gigabit SFP ports.
   b. The unit shall have integral surge protection and shall have failover upon battery loss.
2. Media converter/injector for the camera provides a single port 802.3bt (4PPoE) up to 90W and accommodates all current IEEE standards for Gigabit Ethernet over fiber or twisted pair copper to transmit data. Can be installed with single or multi-mode fiber and/or composite cable

3. Acceptable Manufacturers: Altronix Netway, Omnitron, Perle, Transition or Engineer-approved equivalent.

J. Hardened Switch
1. Hardened switch allows multiple ethernet devices to be connected at the same remote location. Unit shall include minimum (4) ethernet ports compliant with IEEE 802.3bt (4PPoE) up to 90W per port and compliant with all current IEEE standards for Gigabit Ethernet over fiber or twisted pair copper to transmit data.
2. Unit shall include minimum (1) SFP port for fiber transmission. SFP port(s) shall support both multi-mode, single-mode, and single-strand single-mode transmission.
3. Unit shall be compatible with remote power options, including composite cable.
4. Acceptable Manufacturers: Altronix Netway, Extreme, Perle, Transition, or Engineer-approved equivalent.

K. NEMA IP66 Outdoor Enclosure
1. NEMA 4/4X, IP66 Rated power supply/battery outdoor enclosure.
   a. Fiberglass reinforced polyester corrosion resistant enclosure
   b. Wall or pole mountable
   c. Lockable door
2. Enclosure shall be sized to accommodate all equipment.
3. Reference technology drawing details for equipment storage requirements.
4. Acceptable Manufacturers: Altronix, Polycase, Transtector, Hubbell, Hoffman or Engineer-approved equivalent.

L. Composite cable, Fiber plus copper
1. Hybrid Copper-Fiber Cables allow DC power and fiber in one cable to deliver low-voltage power and data over long distances to remote locations where standard power is unavailable.
   a. Indoor/outdoor capability.
   b. OM3 multimode or OS2 single-mode
2. Acceptable Manufacturers: Belden, BerkTek, CommScope, AFL, Panduit or Engineer-approved equivalent.

M. Uninterruptible Power Supply
1. All units whether enclosed in a single housing or utilizing a master slave configuration shall utilize a standard EIA 19" rack mount width and mounting hardware.
2. All units shall be designed for operation on a nominal 120VAC system, with an input range of ±20%.
3. All units shall contain a sealed maintenance free, lead acid battery.
4. All units shall provide both local LED status display, and accessibility via an RJ-45 (8P8C) connector for remote monitoring and shutdown of the unit. Units shall also contain an audible alarm to be annunciated for all alarm conditions.
5. All units shall be compliant with all applicable UL, cUL and IEC ratings and listings.
6. All units shall have fully on-line double conversion operation.
7. Unless otherwise noted on the Drawings, all units shall be sized for a 90 minute run time based on the assigned load with a 20% growth factor. Output capacity has been calculated based on the apparent connected load. The Contractor shall verify the actual load prior to bidding based on the switches being provided and increase any explicit sizing called for on the drawings based on actual installation conditions at no additional cost to the Owner.

8. All units shall provide an SNMP module and Ethernet interface for remote monitoring and orderly shutdown.
9. Acceptable Manufacturers APC, Trip Lite or Liebert

PART 3 EXECUTION

3.01 APPLICATION

A. Provide IP cameras with lenses appropriate for the areas to be covered.

3.02 INSTALLATION

A. Install Video Surveillance System as shown on the Drawings in accordance with manufacturer's written instructions.

B. Provide 120 volt power to all equipment from nearest emergency circuit.

C. Provide grounding of all equipment in accordance with ANSI/EIA/TIA-607.

D. Coordinate Camera height with owner before securing.

E. Install all components in cabinets and racks.

F. Coordinate complete system installation with Owner's representative.

G. Install Ethernet Switches and validate connectivity throughout. Configure all VLANs, IP Routing, and IP Subnets.

H. Install and configure UPS systems.

I. Provide all required Integration Services to setup and program the Network (IP addresses, VLAN's, Routing, Wireless Surveys, etc.).

J. Contractor shall supply the "latest" software updates as part of the system configuration for two (2) years after system acceptance.

3.03 TESTING

A. Provide a complete functional test of all components in accordance with manufacturer's recommendations.

B. Operate system for a minimum of seven (7) consecutive days with no problems before claiming contract completion.

C. Refer to Section 26 08 40, "Electrical Tests, Adjustments, Inspection."

3.04 EQUIPMENT DEMONSTRATION

A. After all system tests have been completed, schedule an instruction period with the Owner. Instruction to be provided by manufacturer's authorized field technician. Include four (4) sessions of four (4) hours each on different days.

B. Instruction shall include:
   1. Location of all components of the system and explanation of their function
   2. Demonstration of equipment
   3. Maintenance and repair procedures
   4. Programming procedures
   5. Review of documents in Record and Information Manuals

C. Contractor shall have all participants sign the Certificate of System Completion in Section 26 00 99, "Requirements for Contract Completion."

3.05 WARRANTY OF WORK

A. Contractor shall warrant all materials, equipment, and workmanship for a period of one (1) year from date of completion.

END OF SECTION

SECTION 31 00 00
EARTHWORK

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes the following:
1. Excavate subsoil and stockpile for later reuse.
2. Grade and contour site to elevations indicated on Drawings.
3. Remove from site excess topsoil and subsoil.
4. Preparing subgrade and filling under slabs on grade, foundations, sidewalks, and paving.
5. Excavation.
6. Fill materials and compaction.
7. Building perimeter backfilling.
8. Subgrade stabilization for pavement subgrade.
9. Excavating and backfilling trenches and structures.
10. Bedding materials.
11. Fill for over-excavation.
12. Finish grade subsoil.
13. Place, level, and compact topsoil.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 02 41 13 – Site Demolition

C. Section 03 30 00 - Cast-in-Place Concrete

D. Section 31 10 00 - Site Clearing

E. Section 31 25 00 - Erosion and Sedimentation Control

F. Section 32 13 00 - Rigid Pavement

G. Section 32 12 00 - Flexible Pavement

H. Section 32 92 00 - Turf and Grasses

I. Section 33 05 00 - Piped Utilities - Basic Methods

J. Section 33 11 00 - Water Utilities

K. Section 33 30 00 - Sanitary Sewerage

L. Section 33 40 00 - Storm Water Utilities

M. Section 33 41 00 - Subdrainage

N. Section 33 50 00 - Natural Gas Distribution

1.03 REFERENCED STANDARDS

A. American Society of Testing and Materials (ASTM).
1. C 136 — Method for Sieve Analysis for Fine and Coarse Aggregates.
2. D 422 — Particle Size Analysis of Soils.
3. D 698 — Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12-inch (304.8 mm) Drop.
4. D 1556 — Test Method for Density of Soil in Place by the Sand-Cone Method.
5. D 1557 — Test Methods for Moisture-Density Relatives of Soils and Soil Aggregate Mixtures Using 120 lb. (4.54 kg) Rammer and 18-inch (457 mm) Drop.
6. D 2487 — Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7. D 2488 — Description and Identification of Soils (Visual — Manual Procedure).
8. D 2922 — Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
9. D 3017 — Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. D 4318 — Liquid Limit, Plastic Limit and Plastic Index of Soils.

B. Occupation Safety and Health Administration (OSHA), 29 Code of Federal Regulations (CFC) Part 1926.650 to .657, Subpart P Construction Standard for Excavations.

C. Ohio Department of Transportation (ODOT); Construction and Materials Specifications.
1. The Terms “Engineer,” “Director,” “City,” and other similar terms shall be interpreted as the Owner
2. In the event of any conflicts between ODOT CMS and the Contract Documents, the most stringent shall apply.
3. Local municipality having jurisdiction.

D. Geotechnical Subsurface Investigation prepared by Geotechnical Consultants Inc. dated July 14, 2022.

1.04 SUBMITTALS

A. Comply with requirements of Division 1 for submittals. Submit two copies of the following items:
1. Material qualification tests for each fill material used and field density test reports directly from Testing Agency.
2. Testing Agency certificate of inspection and compliance with specifications for the following:
   a. Bearing capacity for all footing/foundation subgrades.
   b. Acceptability for both on-site and borrow fill materials, prior to use.
   c. Acceptability of subgrade prior to fill and pavement base placement.
   d. Acceptability of fill placement.
3. Shoring or underpinning plans, signed and sealed by a structural engineer licensed in Ohio.

4. Submit 1-foot square samples of geotechnical fabric and filter fabric.

B. Submit to the testing agency in accordance with Division 1 of the project specifications, one week prior to fill placement in order to perform qualification tests.
   1. 10 lb. sample of each type of fill to the Testing Agency in airtight containers.

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, (the Owner/the Contractor) shall pay for a Testing Agency to perform the following required qualification tests. The Contractor shall coordinate all activities with the Testing Agency and provide the Testing Agency with an accurate schedule and provide notice of field operations.
   1. Qualification tests on each different fill material (both on-site and imported).
   2. Fill Materials: Provide the following information and qualifications tests for each fill material, including select on-site materials, prior to use on project site.
      a. Location of sources for each required imported materials prior to delivery to site.
      b. Analysis of fine and coarse aggregate ASTM C 136.
      c. Particle size analysis of soils ASTM D 422.
      d. Liquid Limit, Plastic Limit and Plasticity Index, ASTM D 4318 — cohesive materials only.
      e. Proctor density or relative density information according to test method identified in the Compaction Requirements Schedule at the end of this section.

B. Fill material shall not be used until qualification tests have been completed and the Testing Agency has approved the fill material.

1.06 DEFINITIONS

A. Stripping: Removal of existing surficial unsuitable materials (see definition) to their entire depth or as indicated.

B. Excavation: Cutting, digging, removing, and wasting materials of every description, including soils, foundations, rock, and whatever substance encountered to dimensions, limits, elevations, and contours as indicated or required by either the Drawings or these Specifications.

C. Rock: Boulders and detached stones having a volume of 2/3 cubic yard or more and any large masses of igneous, metamorphic, or sedimentary rocks, including firmly conglomerated deposits that cannot be removed with a 1 cubic yard capacity power shovel without drilling or blasting.

D. Rock: Dolomite, granite, trap, quartzite, limestone, hard sandstone, slate, or other hard materials, in natural ledges 6 inches or more in thickness, or displaced masses which cannot be excavated or removed by use of: (A) dozer or dozer ripper with a minimum of 250 H.P.; (B) backhoe or shovel with bucket capacity of a minimum of 1.5 C.Y. Removal requires line drilling, blasting, pre-slitting, rock wedging, jack-hammering, hydro-hammering and/or the use of other power tools. A ledge shall be considered to be a continuous deposit of any one of the above materials which may or may not include interbedded seams of soft material that can be measured for thickness, either horizontally or vertically. If vertical thickness of soft material between layers is less than 12 inches, then this material shall be included and measured as rock excavation. If the horizontal thickness of soft material between rock pinnacles measures less than 30 inches, then this material shall be included and measured as rock excavation. Excavation in any material meeting the description of rock will be paid for at a previously established unit price as "rock excavation." Contractor shall notify the Geotechnical Engineer when rock is encountered. The contractor shall make arrangements to have the area surveyed before and after rock removal in order to establish the pay quantity.

E. Unsuitable Materials: Topsoil, loam, gumbo, mud, muck, silt, expansive clay, peat, soils with an organic content greater than 3% by weight, rubbish, debris, foundation and slab materials, paving materials, soil meeting ASTM D 2481 soil classification group ML, MH, CH, OL, OH and PT, rock greater than four (4) inches in diameter, soils with a maximum dry weight of less than 100 pounds per cubic foot, vegetation and frozen or dry lumps. Expansive clay is any clay with a liquid limit in excess of 50 and/or Plasticity Index of 30 or greater.

F. Unstable Materials: Materials which are not classified as unsuitable materials, but due to their condition of being wet, dry, or frozen, are unacceptable for use in fills.

G. Imported Fill Material or Borrow: Approved soil materials from sources other than those made available by required excavation of Project. Imported fill shall be free of unsuitable and unstable materials and shall be approved by the Testing Agency and have a proctor test to be utilized prior to placement.

H. Filling/Backfilling: Placing of approved soil materials in accordance with specified procedures and materials and in conformity with lines, grades, contours, cross-sections and elevations shown on Drawings or required by these Specifications.

I. Subgrade: Undisturbed soil or compacted fill material upon which additional fill, sub-base or base course, footing, foundation, or slab cushion is placed.

J. Engineered Fill: An acceptable soil, aggregate, or man-made material that is placed in a controlled manner to satisfy a defined compaction Specification. The defined compaction Specification would include a maximum lift thickness, acceptable moisture content, and minimum required compaction percentage based on a moisture/density relationship (proctor or relative density).

K. Hydrated Lime: A dry powder obtained by treating quicklime with water enough to satisfy its chemical affinity for water under the conditions of its hydration. It consists essentially of calcium hydroxide or a mixture of calcium hydroxide and magnesium oxide or magnesium hydroxide, or both.

L. Quicklime: A calcined limestone, the major part of which is calcium oxide or calcium oxide in association with magnesium oxide, capable of slaking with water.

M. Pond Liner Material: Cohesive, on-site soils, USCS Classification CL or CL-ML. Soils shall be free of any unsuitable materials with greater than 70% passing the No. 200 sieve. Soils shall have a moisture content at or slightly above maximum of 4% optimum. (Based on the provided soils report, the on-site soil should be acceptable for use as pond liner material. Although, qualification tests will still be required to confirm acceptability).

N. Stabilized Subgrade: Pavement subgrade soil stabilized in accordance with the Testing Agency recommendations and as generally described in Section 3.04.E.

O. Unauthorized Excavation: consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner/Engineer. Unauthorized excavation, as well as remedial work directed by Owner/Engineer shall be at Contractor's expense.
   1. Under footings, foundation bases or retaining walls, backfill unauthorized excavation with lean concrete or extend indicated bottom elevation of footing or base to excavation bottom without altering required top elevation.
   2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer or Testing Agency.

P. Additional excavation: When excavation has reached required subgrade elevations, notify Testing Agency, who will make an evaluation of the conditions. If the Testing Agency determines that bearing materials at required subgrade elevations are unsuitable or unstable, continue excavation until suitable bearing materials are encountered and backfill the excavated area as directed by the Testing Agency based on these specifications. The contract sum may be adjusted by an appropriate contract modification.

1.07 DELIVERY, STORAGE, AND HANDLNG

A. Store and handle all materials to prevent their deterioration from weather.

B. Provide sediment and erosion control around all stockpiles in accordance with Section 31 25 00

C. Sequence work and stockpiles to minimize contamination or mixing of materials.

1.08 PROJECT RECORD DOCUMENTS

A. Accurately record location of existing utilities, their disposition (abandon or active), rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

B. Verify finished grade spot elevations at locations shown on the grading plans.

C. Provide verification surveys for underground and surface storm water detention facilities as described in the general notes included on the plans.

1.09 LAYOUT

A. Employ a Professional Surveyor, registered in State of Ohio, to lay out and establish all lines and grades, including centerline of all structural columns.

B. Erect control points prior to excavation. Protect existing control points.

C. All surveying costs to be paid by the Contractor performing the work.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type A – ODOT Item 411 - Stabilized Crushed Aggregate.

B. Type B – Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
1. Minimum Size: 1/4 inch.
2. Maximum Size: 5/8 inch.

C. Type C – Sand: Natural river or bank sand, washed: free of silt, clay, loam, friable or soluble materials, or organic matter graded in accordance with ANSI/ASTM C136, within the following limits.

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Type D - Subsoil–Reused, select onsite or borrow soil materials conforming to the following:
1. ASTM D2487 Soil Classification Groups GW, GC, GM, SW, SC, SM, CL, and ML.
2. Less than 3% organic material by weight.
3. Free of unstable or unsuitable material or construction debris.
4. Conform with ODOT item 203.02.R

E. Type E – ODOT Item 703, size no. 57 aggregate.

F. Type F – ODOT Item 653.02 Topsoil: Fertile, friable, fine sandy clay loam, uniform in composition, capable of sustaining vigorous plant growth and free of subsoil, stones, lumps, clods of hard earth, plants, plant roots, sticks, noxious weeds, slag, cinders, demolition debris or other extraneous matter over 1 inch in the largest dimension.

G. Type G - Concrete: Structural concrete conforming to Section 03 30 00, "Cast-in-Place Concrete" with a compressive strength of 4500 psi.

H. Type H - Drainage Fill: ODOT Item 703, Size No. 8 aggregate.

I. Type I – Low Strength Mortar Backfill: ODOT Item 613

J. Type J - Aggregate Base: ODOT Item 304.

K. Type K – Bank Run Gravel: The material shall consist of bank run sand and gravel, free of frozen materials, wood, rubbish, and unsuitable or unstable material. It shall have no more than 20% passing the No. 200 sieve and no particle size larger than 3 inches. Sources of borrow shall be designated well in advance of construction and the material shall be approved by the Testing Agency prior to beginning work.

2.02 CONSTRUCTION FENCE

A. Plastic construction fence, orange in color, with the following properties:
   1. Material - Co-polymer
   2. Typical Aperture Size - 1.3 inches x 1.3 inches
   3. Minimum Tensile Strength:
      a. MD 850 lbs./ft. width
      b. TD 1050 lbs./ft. width
      c. MD 4850 psi
      d. TD 5810 psi
   4. Junction Strength - 90% of rib strength (minimum) Nominal Porosity – 75%
   5. Ultraviolet Resistance - Fully stabilized
   6. Temperature Range - -22 degrees F to 150 degrees F
   7. Manufacturer - Tensar Safety Grid or approved equal

PART 3 EXECUTION

3.01 GENERAL

A. The following Specification shall be considered as general criteria for earthwork operations. In those instances where field conditions arise which are not adequately covered by these criteria, instructions for that specific condition will be issued by the Architect/Engineer.

B. Dust Control:
   1. Use all means necessary to control dust on and near the work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the work or if resulting from the condition in which the Contractor leaves the site.
   2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

C. Grading operations shall be performed in such a manner as to direct and control storm water runoff so that no damage or erosion occurs. Saturation of cut and fill areas shall be prevented by directing storm water runoff and not allowing ponding to occur. Fills are to be crowned as required to maintain drainage at the end of each work day. Existing drainage routes shall not be choked or obstructed until new ones are available. Temporary culverts, pumps or other equipment shall be used to facilitate drainage of fills during construction, failure to drain storm water shall not be grounds for delay of this contract due to saturated site conditions. The Contractor shall remove and dispose of saturated materials in excess of allowable moisture content at compaction and shall maintain the project schedule at all times.

D. Dewatering: All excavation, construction, and backfill of pipes or other facilities to be constructed under this Contract shall be constructed under dry conditions. The Contractor shall constantly maintain all excavations in a dewatered, workable condition, and shall be responsible for installing, operating, maintaining and removing such dewatering systems as are required.

E. Site Grading:
   1. Existing Conditions: Visit site and verify earthwork requirements prior to commencing work.
      a. Existing Grades: Existing grades and contours are indicated on Drawings and represent the best information available on actual existing site conditions. Verify existing grades prior to commencing work. Commencement of work is construed as acceptance of grades and/or contours as correct.
      b. Subsurface Conditions: Results of explorations are for use in estimating work quantities and design parameters, and for the information of the Bidders only, and neither the Owner nor the Associate/Engineer will be responsible for variations in subsoil deposition and quality or for changes which may have occurred after the investigations were made.
      c. See logs of explorations for indication of existing soil and rock boundaries.
   2. Required contours and elevations are indicated and noted on the Drawings. Should indicated figures conflict with actual conditions and contours, notify the Engineer and await their direction before proceeding.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Identify and flag above grade utilities.

D. Maintain and protect existing utilities remaining which pass through work area.

E. Notify utility company to remove and relocate utilities.

F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.03 ROUGH GRADING AND EMBANKMENT CONSTRUCTION

A. Rough Grading:
   1. Site clearing and grubbing shall be done prior to any rough grading in accordance with Section 31 10 00. All debris and deleterious material shall be removed from areas to be filled or backfilled in accordance with this specification.
   2. Dispose of excess excavated material or supply additional suitable material as necessary to complete the rough grading to the required elevations.
   3. The finished subgrade surface shall be reasonably smooth and free from irregular surface changes and shall be no more than 0.05 feet above or below the approved subgrade elevation.

4. Newly graded areas shall be protected from the action of the elements. Any damage that may occur as a result of natural causes or any construction activities, prior to the acceptance of the work, shall be repaired and grades re-established to the required elevations and slopes.
5. During the performance of rough grading operations, the subgrade shall be proof-rolled under the direction of the testing agency. The proof-roll shall be performed by heavy equipment (minimum 30-ton dual axle dump truck). Any areas discovered which are soft and unstable or exhibit other conditions (pumping or rutting), shall be stabilized immediately as directed by the Testing Agency using one of the following options:
   a. Scarifying, aerating and recompacting.
   b. Over-excavating and replacing with acceptable fill material.
   c. Using lime or lime/fly ash modification techniques.
6. Removal of unsuitable material and its replacement as directed shall be paid on basis of contract conditions relative to changes in work.
7. In general, subgrade shall be established at the following levels:
   a. For Pavement Areas: Finish grade less the thickness of pavement and base material.
   b. For Structures: Finish floor elevation less the thickness of the slab and aggregate backfill per Section 3.07.C.
   c. For Lawn Areas: Finish grade less topsoil thickness.
   d. Sidewalks and Plazas: Finish grade less sidewalk and aggregate base thickness.
   e. Landscape Area: Finish grade less topsoil and mulch.

B. Subgrade Preparation:
   1. Proof Rolling:
      a. All subgrade surfaces shall be proof rolled by means of heavy equipment (minimum 30-ton dual axle dump truck) to locate and permit timely correction of the subgrade deficiencies. Proof rolling shall be witnessed by the Testing Agency and approved by Testing Agency prior to continuing work.
      b. In cut sections, proof rolling of the subgrade surface shall be done to determine the location and extent of areas below subgrade surface that may require subgrade undercutting. Should any portion of the cut subgrade surface fail to provide satisfactory support for the proof-rolling operation, the Testing Agency may order corrective undercut and backfill work done. Refer to Section 3.03, Paragraph A.5 and A.6 for corrective measures.
      c. In embankment sections, prior to placing the embankment, proof rolling on the subgrade surface shall be done to determine the uniformity of the compaction below the subgrade and any deficiencies requiring corrective work. Any deficiencies discovered during proof rolling operations shall be corrected in a manner satisfactory to the Testing Agency. Refer to Section 3.03 Paragraph A.5 and A.6 for corrective measures. After all corrective work has been completed, the surface shall be proof rolled again. Corrective work shall not be considered complete and acceptable until the embankment shows satisfactory and uniform response to the proof rolling operations.

2. Construction:
   a. Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 1/2 inch when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.
3. Compaction:
   a. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to a maximum density in accordance with the Compaction Requirements Schedule at this end of this specification.

C. Embankment:
1. Initial Lift: After proof rolling of the existing subgrade has been completed, the surface of the area to be filled shall be scarified to a depth of 6 inches. An initial 3-inch layer of fill material shall then be spread over the scarified surface and the entire area compacted as specified.
2. Fill Lift Thickness: Areas requiring fill shall be filled and backfilled using suitable materials compacted in layers not to exceed the following (all thicknesses are loose thicknesses):
   a. Within building areas - 8 inches.
   b. Under pavements, sidewalks or plazas - 8 inches.
   c. General site fill - 12 inches.
3. Moisture Content: Placed material shall not deviate from the optimum by more than two percent (+/-2%). Moisture content of any material which displays pronounced deformation under construction equipment shall not exceed the optimum. Drying of wet soil shall be performed with the use of plows, discs, harrows, or other approved methods. If additional water is required, it should be uniformly distributed through the use of approved water wagons and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.
4. Amount of Compaction: After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to not less than the percent shown under the Compaction Requirements Schedule in accordance with ASTM Method (D-698).
5. Compaction of Embankment Layers: Compaction equipment shall be of such design that it will be able to compact the fill to the specified density. Compaction of each layer shall be continuous over its entire area and the compaction equipment shall make sufficient trips to ensure that the required density has been obtained.

6. Density Tests: Field density tests shall be made by the Testing Agency per the Compaction Requirements Schedule. Density tests shall be taken in compacted material below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below the required density, the particular layer or portion shall be reworked until the required density has been obtained.
7. Seasonal Limits: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not resume until the Testing Agency indicates that the moisture content and density of the previously placed fill are as specified.
8. Drainage: The embankment and borrow areas should be maintained in a freely draining condition at all times. Proper drainage should be provided for any water or springs which may be encountered.
9. Existing Slopes: When the embankment meets the natural grade of a slope, a bench shall be cut in the existing slope. These cuts are to serve as keys to connect the existing grade with the newly placed fill.
10. Unacceptable Fill Subgrade Material: Frozen fill material or any suitable fill shall not be placed on frozen or snow-covered surfaces.
11. Soft and Wet Soils: If soft, yielding material is encountered in embankments as a result of trapping water, and cannot be satisfactorily stabilized by moisture control and compaction, the unstable material shall be excavated to the depth required by the Testing Agency. The excavation shall then be filled with suitable material and compacted in accordance with the requirements outlined above.
12. Rock: When fill material includes rock, the maximum rock size acceptable shall be 4 inches. No large rocks shall be allowed to nest and all voids must be carefully filled with small stones or earth, properly compacted. No large rocks will be permitted within 12 inches of the finished grade.
13. Shale and Siltstone: Shale and siltstone which consist predominately of fine particles which can be readily tested for compaction shall be placed and compacted in accordance with requirements for soil. Shale and siltstone containing sufficient amounts of large particles to make testing of the compaction impracticable shall be broken down in placing until the voids between the particles are filled insofar as is practicable. When necessary, water shall be used to aid in breaking down the shale. Watering of the shale should be performed by means of tank trucks equipped with suitable sprinkling devices and shall be thoroughly incorporated into the material which is to be mixed by means of discs or other equipment

    Shale and siltstone embankment materials shall be sprinkled to bring the moisture content to within a range of optimum minus 3% to optimum plus 3%. Compaction shall be accomplished with a vibratory sheepsfoot roller in conjunction with a static sheepsfoot roller. The minimum weight for the static sheepsfoot roller shall be 60,000 lbs. The minimum total compactive effort for the vibratory tamping foot roller shall be 50,000 lbs. in accordance with the manufacturer's Specifications. Larger rollers will be permitted as required to obtain density. At the decision of the Geotechnical Engineer, vibration may not be used on fill materials that are predominately cohesive in nature. Each embankment lift shall receive a minimum of three (3) passes with the static roller and a minimum of two (2) passes with a vibratory roller. The rollers should not exceed three (3) miles per hour during these passes.

Mixtures of shale and siltstone and rock shall be placed in accordance with the above noted provisions for shale and siltstone. Rock in such mixtures shall be reduced in size not to exceed 8 inches or separated from the mixture and placed as rock fill.

14. New Embankment on Existing Slopes: When embankment is to be placed and compacted on hillsides or where new embankment is to be compacted against existing embankments, slopes that are steeper than 8:1 shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment.

D. Stabilized Subgrade:
   1. Once the Contractor has selected a chemical stabilization, said Contractor shall provide the Testing Agency a sample of significant size for testing.
   2. The Testing Agency will perform soils tests and determine the acceptability of the Mixture.
   3. The Contractor may be required to prepare alternative additives for testing until a suitable additive is selected.
   4. The Testing Agency shall observe and test all subgrade stabilization to confirm acceptance as pavement subgrade.

3.04 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or regraded and stockpile in area designated on site.

B. Seed stockpile in accordance with Section 31 25 00, "Erosion and Sediment Control."

3.05 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil and whatever material encountered required to accommodate building foundations, slabs-on-grade, paving and site structures, and construction operations.

C. Machine slope banks.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter. Compact bottoms of excavations with a plate vibrator if directed by the Testing Agency. All excavations to be protected as work progresses.

G. Remove lumped subsoil, boulders, and rock greater than 1/3 cubic yard measured by volume.

H. Notify Testing Agency or Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Correct areas over-excavated by error at no extra cost to the Owner.

K. Remove all excavated material from within building area.

L. Contractor solely responsible for means and methods employed to excavate materials encountered on site.

M. It is intent of Contract Documents that excavation cuts be used as forms for vertical surfaces of footings and column pads. Soil conditions which prevent vertical cuts, or excavation characteristics which require forming concrete are responsibility of General Trades Contractor.

N. Prior to placing concrete for the footings, all foundation excavations shall be inspected and approved by the Testing Agency, for the bearing capacity indicated on the Drawings.

3.06 BUILDING FILL AND BACKFILL

A. Remove any accumulated debris from excavations before backfilling.

B. Backfill on interior side of perimeter footings and foundation walls and on both sides of interior footings and foundation walls with Type A or Type H fill. Place in 8-inch layers, compact with vibratory compaction equipment to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

C. Construct gravel base under floor slab of Type A, Type E, or Type H fill within building area to provide a layer of minimum 4-inch thickness. Shape subgrade and gravel base for floor slab construction per Drawings.

D. Within all areas to receive asphalt or concrete pavement immediately adjacent to exterior walls, backfill on exterior of foundation walls with Type A, Type H, Type J, or Type K fill. Place in 8-inch layers, compact with vibratory compaction equipment to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

E. Backfill at all other exterior foundation walls with suitable excavated material. Place material in 8-inch layers and compact to 98% of the maximum dry unit weight. Backfill to level slightly above grade at building exterior to drain water away from building. At walls with foundation drains and/or weep holes, provide Type A or Type H material for extent indicated on structural drawings. Place material in 8-inch layers and compact to a maximum dry unit weight as shown in the compaction requirements schedule at the end of this section.

F. Exercise caution to avoid damage to foundation damp-proofing during backfill and compaction operations.

3.07 SUBSOIL PREPARATION FOR PLACING TOPSOIL

A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of 2 inches in size. Remove subsoil contaminated with petroleum products.

B. Scarify subgrade to depth of 6 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.08 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is scheduled.

B. Use topsoil in relatively dry state.

C. Place during dry weather.

D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

E. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.

F. Manually spread topsoil around trees, plants, building and curbs to prevent damage.

G. Roll placed topsoil.

H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.09 SCHEDULE OF LOCATIONS

A. The following paragraphs identify compacted topsoil thicknesses for various locations.
1. Seeded Areas: 6 inches minimum
2. Sod: 6 inches minimum
3. Shrub Beds: 18 inches minimum
4. Flower Beds: 12 inches minimum
5. Planter Boxes: To within 3 inches of box rim

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by an independent Testing Agency.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM C136 and with Division 1.

C. Compaction testing will be performed in accordance with ANSI/ASTM D2922 and D3017 and with Division 1.

D. Field density test reports shall clearly identify the following information for each test:
1. Horizontal and vertical location of test
2. Material type being tested
3. Proctor test method
4. Maximum proctor density
5. Specified density
6. Optimum moisture content
7. Field test method
8. Actual moisture content
9. Tested density

10. Pass/fail indication

E. Do not submit reports of failing tests without follow-up report of reworked area and passing retest. Submitted test reports without specified information will be returned for revisions and resubmittal.

F. Submit rough draft of daily Field Observation Report to the Engineer via facsimile the day of the field visit. Follow up with formal report.

G. Excavate, replace at near optimum moisture, recompact and retest all areas failing to meet compaction requirements at no additional cost.

3.11 ACCEPTANCE

A. Top Surface of Backfilling: Under Paved Areas: Plus, or minus 0.05 feet from required elevations.

B. Top Surface of General Backfilling: Plus, or minus 0.05 feet from required elevations.

3.12 SCHEDULE OF FILL MATERIAL AND COMPACTION REQUIREMENTS SCHEDULE

A. Compact fill materials to meet the following minimum Standard Modified Proctor Density, (ASTM D698).

LOCATIONS	MATERIAL TYPES												COMPACTION REQUIREMENTS	
	A ITEM 411	B PEA GRAVEL	C SAND	D SUBSOIL	E ITEM 703 57	F TOPSOIL	G CONCRETE	H ITEM 703 8	I CDF	J ITEM 304	K BANK RUN GRAVEL	L NSDB	% COMPACTION	MINIMUM TEST / UNIT AREA / LIFT
Aggregate base under exterior concrete slabs, sidewalks, and plaza areas.	X									X		X	98%	1/1000 SY
Foundation wall backfill as defined in "Building Fill & Backfill."	X							X					98%	1/100 SY
Areas to receive asphalt or concrete pavement or walks immediately adjacent to exterior walls.	X							X		X	X		100%	1/500 SY
Aggregate base beneath interior floor slab.	X				X			X					100%	1/500 SY
General site fill, both paved and non-paved areas, utility trenches outside paved areas, utility trenches under pavement in excess of 48 inch depth, corrective backfill, areas to receive lawns immediately adjacent to exterior walls.				X									98%	1/1000 SY
Sewer bedding.					X								N/A	N/A
Underdrains, french drains, aggregate drainage material behind site retaining walls.					X			X					N/A	N/A
Abandoned utilities, trench backfill where shown on drawings.									X				N/A	N/A
Utility trenches less than or equal to 48 inch depth under pavement.	X									X			100%	1/300 LF
Aggregate base beneath asphalt roads.										X			100%	1/500 SY
Fill beneath floor slabs and aggregate base or foundations, corrective backfill for over excavation, or fill for removed foundations.	X			X						X	X	X	100%	1/500 SY
Finish slopes, lawn areas, planters.						X							N/A	N/A
Sewer Encasement							X							

3.13 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring and post with warning lights from dusk to dawn each day and as otherwise required.

B. Erect construction barriers to prevent public access to the area of the Work. Maintain in place throughout the new construction operations. Erection, maintenance, alterations, and removal of the barriers shall be the responsibility of the Contractor.

C. Do not close or obstruct streets or sidewalks without the proper permit. Conduct operations with minimum traffic interference.

D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

E. Protect public and private property adjacent to and on the job site, including vents, utility lines, roadways, sidewalks, light standards, hydrants, and trees not indicated for removal. Repair damage to the property at no cost to the Owner.

F. Notify local authorities having jurisdiction of existing damage in adjacent streets or improvements such as paving, curbs, gutters, sidewalks and alley surfacing, prior to start of demolition work. If damage to streets and improvements is discovered after work has commenced, and such damage was not reported before start of work, the Contractor will perform and pay for the necessary repairs.

G. Maintain and preserve utilities transversing premises as long as they are required. Backfill and compact all excavation made for removal of utilities.

H. Seal or cap all utility lines leading from demolished structures in accordance with regulations of authorities having jurisdiction.

I. Before starting work related to existing utilities such as electrical, sewer, water, heat, gas and fire lines that will temporarily discontinue or disrupt service to any existing building, notify the utility companies 72 hours in advance and obtain approval in writing before proceeding with this phase of work.

J. Earthwork:
   1. Stability of temporary excavations:
      a. All excavations shall be in accordance with OSHA requirements.
      b. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
      c. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
   2. Shoring:
      a. Except as specified elsewhere, provide all shoring required for earthwork or required as a result of earthwork for safety of workers, existing structures, public or adjacent properties.
      b. Provide materials for shoring and bracing in good serviceable condition.

c. Establish requirements for shoring and bracing to comply with local codes and authorities having jurisdiction.
d. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

K. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes the following:
   1. Remove surface debris.
   2. Clear site of vegetation.
   3. Remove trees and shrubs.
   4. Remove stumps and root system of trees and shrubs.
   5. Remove construction debris.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 31 00 00 – Earthwork

C. Section 31 25 00 – Erosion and Sedimentation Control

1.03 QUALITY ASSURANCE

A. Conform to applicable code for disposal of debris.

B. Coordinate clearing Work with utility companies.

C. Contractor to dispose of removed trees and shrubs off site in accordance with local codes.

1.04 DEFINITIONS - The following definitions govern site preparation, clearing, and demolition operations.

A. Clearing: Removal and disposal of all site vegetation.

B. Demolition: Removal and disposal of an existing constructed site element in its entirety both above and below grade or unless otherwise indicated on the Drawings.

C. Trees: Plant material having a trunk diameter of 3 inches or larger measured 1 foot above the ground. Multi-stemmed trees are considered as one tree.

D. Bush and/or Vegetation: Plant material having a stem diameter less than 3 inches at any point between grade and 1 foot above grade.

E. Debris: Any material such as rubbish, concrete, bricks, fencing, culverts, windfalls, decaying matter, ash, etc., including materials generated from the demolition of existing structures, surface materials, utilities and brush and tree removal.

F. Structure: All connected parts of a constructed object to its full extent both above and below grade.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that existing plant life and features designated to remain are tagged and identified.

3.02 GENERAL

A. Clear areas shown on Drawings for access to site and execution of work.

B. Remove trees and shrubs indicated. Remove stumps and root system to a depth of 24 inches.

C. Clear undergrowth and deadwood without disturbing subsoil.

3.03 PROTECTION

A. Protection of Existing Trees, Landscaping and Natural Features:
   1. General Requirements: The Contractor shall protect, throughout the course of construction, all such trees as are shown on the Drawing or marked by the Owner's agent as save.
      a. The Contractor shall also protect throughout the course of construction all landscaping, vegetation, and natural features on public and private property. The Contractor shall use every precaution to prevent injury, damage, pollution, erosion or destruction of existing landscaping, vegetation, and natural features, including drainage ways, ponds, lakes, swamps, woods, and fields.
   2. The limits of clearing shall be located outside the drip line of any tree to be retained, and in no case closer than 5 feet to the trunk of such a tree.
   3. Marking: Prior to construction and before the preconstruction conference, individual trees and stands of trees to be retained within the limits of clearing shall be visibly marked with a bright color paint or surveyor's ribbon applied in a band circling the tree at a height visible to equipment operators.
   4. Pre-Construction Conference: During any preconstruction conference, tree preservation and protection measures should be reviewed with the Contractor as they apply to that specific project.
   5. Equipment Operation and Storage: Heavy equipment, vehicular traffic, or stockpiles of any construction materials including topsoil shall not be permitted within the drip line of any tree to be retained. Trees being removed shall not be felled, pushed, or pulled into trees being retained. Equipment operators shall not clean any part of their equipment by slamming it against the trunks of trees to be retained.
   6. Fires: Fires shall not be permitted within 100 feet from the drip line of any trees to be retained.

7. Storage and Disposal of Toxic Materials: No toxic materials shall be stored closer than 100 feet to the drip line of any trees to be retained. Paint, acid, nails, gypsum board, wire, chemicals, fuels, and lubricants shall not be disposed of in such a way as to injure vegetation.
8. Fencing and Armoring: Refer to the drawings for the location and details of Protection Authority. Trees to be retained within 40 feet of a proposed building or excavation shall be protected by fencing. Personnel must be instructed to honor protective devices. The devices described below are suggested only and are not intended to exclude the use of other devices which will protect the trees to be retained.
    a. Snow Fence - Standard 40-inch-high snow fence shall be placed at the limits of clearing on standard steel posts set 6 feet apart.
    b. Board Fence - Board fencing consisting of 4-inch square posts set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with a minimum of two (2) horizontal boards between posts. If it is not practical to erect a fence at the drip line, construct a triangular fence nearer the trunk. The limits of clearing will still be located at the drip line, since the root zone within the drip line will still require protection.
    c. Cord Fence - Posts with a minimum size of 2 inches square or 2 inches in diameter set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with two (2) rows of cord 1/4 inch or thicker at least 2 feet apart running between posts with strips of colored surveyor's flagging tied securely to the string at intervals no greater than 3 feet.
    d. Earth Berms - Temporary earth beams shall be constructed according to Specifications for a TEMPORARY DIVERSION DIKE (Specification 31 25 00, Paragraph 3.08) with the base of the berm on the tree side located along the limits of clearing. Earth berms may not be used for this purpose if their presence will conflict with drainage patterns.
    e. Additional Trees - Additional trees may be left standing as protection between the trunks of the trees to be retained and the limits of clearing. However, for this alternative to be used, the trunks of the trees in the buffer must be no more than 6 feet apart to prevent passage of equipment and material through the buffer. These additional trees shall be reexamined prior to the completion of construction and either given sufficient treatment to ensure survival or removed.
    f. Trunk Armoring - As a last resort, a tree trunk can be armored with burlap wrapping and 2-inch studs wired vertically no more than 2 inches apart to a height of 5 feet encircling the trunk. If this alternative is used, the root zone within the drip line will still require protection. Nothing should ever be nailed to a tree.
9. Fencing and armoring devices shall be in place before excavation or grading is begun, shall be kept in good repair for the duration of construction activities, and shall be the last items removed during the final cleanup after the completion of the project.
10. Grading and/or Filling Around Trees: Grading and/or filling operation within the protective fencing shall be carried on with extreme care only under the direct supervision of the Architect. If the soil over the root area of the trees has been compacted, it shall be restored by proper cultivation to permit entrance of water and proper aeration of roots.
11. Cutting of Tree Roots and Limbs: Roots and limbs of trees are not to be cut unless authorized by the Owner's agent. Should it become necessary to do so, the Contractor shall treat the remaining exposed portion of roots and/or limbs to prevent damage, loss, or injury to the tree. This treatment shall be done in accordance with accepted horticulture practice and by personnel experienced in that field of work.

B. Protect utilities, structures, and site features to remain, from damage.

C. Protect bench marks and existing structures from damage or displacement.

D. Repair damage to the satisfaction of the owner.

3.04 REMOVAL

A. Remove debris, rock, and extracted vegetation from site.

3.05 BACKFILLING

A. Backfill any excavations associated with clearing in accordance with Specification Section 31 00 00.

3.06 EROSION AND SEDIMENT CONTROL

A. Comply with all requirements of Section 31 25 00, “Erosion and Sediment Control.”

B. Execute all appropriate indicated or otherwise required erosion and sediment control items prior to clearing and/or demolition activities.

C. Execute any remaining erosion/sediment items as soon as practical after clearing operations.

D. Conform to the requirements of the local authority.

END OF SECTION

SECTION 31 23 33
PIPED UTILITIES-BASIC METHODS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes the following:
   1. Excavate trenches for utilities from outside building to municipal utilities or as shown on Drawings.
   2. Backfilling and compaction.
   3. Compacted bedding for utilities.
   4. Compaction.

1.02 RELATED SECTIONS

A. Work under this section is subject to the requirements of the Contract Documents including General Conditions, Supplementary Conditions, Drawings, and sections under Division 01 General Requirements.

B. Section 01 40 00 - Quality Requirements

C. Section 03 30 00 - Cast-in-Place Concrete

D. Section 31 00 00 - Earthwork

E. Section 33 11 00 - Water Utilities

F. Section 33 30 00 - Sanitary Sewerage

G. Section 33 40 00 - Storm Water Utilities

H. Section 33 41 00 - Subdrainage

I. Section 33 50 00 - Natural Gas Distribution

1.03 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM).
   1. C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12-inch (3.04.8 mm) Drop.
   3. D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
   4. D1557 - Test Methods for Moisture-Density Relations of Soils and Soil -Aggregate Mixtures using 10 lb. (4.54 kg.) Rammer and 18-inch (457 mm) Drop.
   5. D2922 - Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. D3017 - Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

B. Ohio Department of Transportation (ODOT); Construction and Materials Specifications.
   1. The Terms “Engineer,” “Director,” “City,” and other similar terms shall be interpreted as the Owner
   2. In the event of any conflicts between ODOT CMS (CMSC) and the Contract Documents, the most stringent shall apply.

1.04 SUBMITTALS

A. Comply with the requirements of Division 1 for submittals and specification section 31 00 00 for bedding and backfill, testing, and sampling requirements.

1.05 QUALITY ASSURANCE

A. The Testing Agency shall provide compaction testing for bedding and backfill and document any necessary over excavation and stabilization in utility trenches in accordance with Specification Section 31 00 00, "Earthwork."

B. Coordinate schedule with Testing Agency.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and grade all materials to prevent their deterioration from weather.

B. Provide sedimentation and erosion control around stockpiles in accordance with Section 31 25 00, “Erosion and Sediment Control”.

C. Separate work and stockpiles to minimize contamination or mixing of materials.

1.07 PROJECT RECORD DOCUMENTS

A. Accurately record location of pipe runs, connections, inlets, manholes, valves, fittings, elevations, inverts, and slope gradient.

B. Provide locations and disposition (active/abandoned) of any utilities encountered during trenching activities.

1.08 LAYOUT

A. Employ a Professional Surveyor, registered in State of Ohio, to lay out and establish all lines and grades, including centerline of all structural columns.

B. Erect control points prior to excavation. Protect existing control points.

C. All surveying costs to be paid by the Contractor performing the work.

PART 2 PRODUCTS

2.01 BACKFILL MATERIALS

A. As specified in Section 31 00 00, "Earthwork."

2.02 BEDDING MATERIALS

A. Type B, C, E or G Material: As specified in Section 31 00 00, "Earthwork."

2.03 GEOTEXTILE FABRIC

A. Fabric: Mirafi Geotextile, 160 N or equal for use with underdrain.

PART 3 EXECUTION

3.01 GENERAL

A. Provided trenches, bedding and backfill in accordance with specification Section 31 00 00.

B. Hand trim excavations to required elevations. Correct over excavation with compacted fill material per Section 31 00 00.

C. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling and compaction.

3.02 EXAMINATION

A. Site Information: Verify existing utility locations within construction limits.

B. Locate existing structures and piping to be closed and abandoned.

C. Identify required lines, levels, contours, and datum.

D. Maintain and protect existing utilities remaining, which pass through work area. Repair damaged utilities to the satisfaction of the Owner of the utility and the Associate Engineer.

3.03 PROTECTION OF PERSONS AND PROPERTY

A. The Engineer has designed a project which will be safe after full completion. The Engineer has no expertise in, and takes no responsibility for, construction means and methods or job site safety during construction, which are exclusively the Contractor's responsibility. Processing and/or approving submittals made by the Contractor which may contain information related to construction methods or safety issues, or participation in meetings where such issues might be discussed, shall not be construed as voluntary assumption by the Engineer of any responsibility for safety procedures.

B. Earthwork:
   1. Stability of temporary excavations:
      a. All excavations shall be in accordance with OSHA requirements.

b. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
c. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

2. Shoring:
   a. Except as specified elsewhere, provide all shoring required for earthwork or required as a result of earthwork for safety of workers, existing structures, public or adjacent properties.
   b. Provide materials for shoring and bracing in good serviceable condition.
   c. Establish requirements for shoring and bracing to comply with local codes and authorities having jurisdiction.
   d. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

D. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

E. Protect above and below grade utilities to be removed, abandoned, or remain.

3.04 EXCAVATION

A. Excavate subsoil and whatever material encountered including rock, required for storm sewers, sanitary sewers, water, and gas piping. See rock definition in Earthwork Section. Rock excavation will be paid on a unit price basis.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection and as shown on details provided on Drawings.

C. Excavations shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock greater than 1/3 cu. yd. measured by volume.

F. Correct unauthorized excavation in accordance with Section 31 00 00 at no cost to Owner.

G. Correct areas over-excavated by error in accordance with Section 31 00 00 at no cost to Owner.

H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

I. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type D fill and compact to density equal to or greater than requirements for subsequent backfill materials. Corrective undercut and backfill will be paid for per Earthwork Section, Paragraph 3.03, A.6.

J. Dewatering: All excavation, construction and backfill of pipes or other facilities to be constructed under this Contract shall be constructed under dry conditions. The Contractor shall constantly maintain all excavations in a dewatered, workable condition, and shall be responsible for installing, operating, maintaining, and removing such dewatering systems as are required. The evaluation of the sufficiency of the condition shall be made by the Testing Agency and his/her decision shall be binding upon the Contractor. If the Testing Agency determines that dewatering is inadequate, the Contractor shall modify his/her methods until such time as the Testing Agency then agrees with the adequacy of the operating condition.

3.05 BEDDING

A. Support pipe and conduit during placement and compaction of bedding fill.

B. Bed per Standard Details provided on Drawings and Schedule at the end of this Section.

3.06 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.

E. Employ a placement method that does not disturb or damage conduit in trench.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Leave fill material stockpile areas completely free of excess fill materials.

3.07 MATERIAL SCHEDULE

A. Storm and Sanitary Piping:
1. Bedding Fill: Type E, per Standard Detail, compacted to 95%.
2. Backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type J in 8-inch lifts compacted to 100%.
4. Under roadways, parking lots, sidewalks, and plaza areas where cover from top of subgrade to top of pipe is 30 inches or less, provide concrete encasement per Standard Detail.

B. Waterlines:
1. Bedding Fill: Type E under roadways, parking lots, sidewalks, and plaza areas. Type D in lawn areas, washed, rounded stone (crushed stone not acceptable).
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.

3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type A or Type J in 8-inch lifts, compacted to 100%.

C. Gas Lines:
1. Bedding Fill: Not required. Provide 6 inches of Type C all around gas line.
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadways, parking lots, sidewalks, and plaza areas, backfill with Type A or Type C in 8-inch lifts, compacted to 100%.

D. Force Main Piping:
1. Bedding Fill Type E, washed, rounded stone (crushed stone not acceptable).
2. In lawn areas, backfill with Type D in 8-inch lifts, compacted to 98%.
3. Under roadway, parking lots, sidewalks, and plaza areas, backfill with Type A or J in 8-inch lifts, compacted to 100%.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1 and Section 31 00 00.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM C136 and with Division 1.

C. Compaction testing will be performed in accordance with ASTM D2922 and ASTM D3017 and with Division 1.

D. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest, and repeat until a passing test is achieved at no cost to Owner.

E. Frequency of Tests: Every 100 feet and every lift.

3.09 ACCEPTANCE

A. Top Surface of Backfilling: Under Paved Areas: Plus, or minus 0.05 feet from required elevations.

B. Top Surface of General Backfilling: Plus, or minus 0.05 feet from required elevations.

3.10 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1.

B. Recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Temporary and permanent erosion and sediment control.

B. Comply with OEPA requirements and Stormwater Pollution Prevention Plan prepared for this project.

1.02 RELATED WORK

A. Section 31 00 00, "Earthwork"

B. Section 32 92 00, "Turfs and Grasses"

1.03 SUBMITTALS

A. Comply with requirements of Division 0 and 1. Submit material qualification tests and certificates of compliance as indicated.

B. In accordance with the Stormwater Pollution Prevention Plan (SWPPP) prepared for the project, all stormwater BMPs shall be inspected once every seven (7) days and within 24 hours of a 0.5 inch or greater rainfall. Inspection logs (included herein) shall be kept and shall be submitted to the Owner or Ohio EPA upon request.

C. At project completion (when all seeding and landscaping is well established), Contractor shall complete and submit to the Ohio EPA the included Notice of Termination (NOT) to terminate coverage from the NPDES General Permit. A copy of the NOT and transmittal shall be provided to the Owner and the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Type F Material - Section 31 00 00, "Earthwork."

B. Filter Barrier Geotextile: The geotextile shall be of either woven or nonwoven construction and consist of long chain polymeric filaments or fibers composed of polypropylene, polyethylene or polymide. The filament and fibers shall be oriented into a stable network whereby they retain their positions relative with each other. The geotextile shall be ultraviolet stabilized and shall be inert to chemicals commonly found in soil. The geotextile shall meet or exceed physical properties of Supac 5NPUV or Supac G WMUV.
   1. Grab Tensile Strength: 90 lb. minimum as measured per test method ASTM D 1682.
   2. Mullen Burst Strength: 190 psi minimum as measured per test method ASTM D 3786.
   3. Slurry Flow Rate: 0.3 gal./min./ft2 maximum.
   4. Equivalent Opening Size: 40-80 as measured per test method US Std. Sieve CW-02215.

5. Ultraviolet Radiation Stability: 70% minimum as measured per test method ASTM D 4355.

C. Filter Barrier Stakes: 2" x 2" x 3'-0" wooden stakes.

D. Rock Channel Protection: Quarried stone meeting the requirements of ODOT Item 601.09 Rock Channel Protection, Type A, B, C, or D with filter, as noted on Drawings.

E. Seed and Soil Supplements for Temporary Seeding: Provide seed mixture with 20% by weight of perennial ryegrass, 30% red fescue and 50% Kentucky Blue Grass. Provide pulverized agricultural limestone and commercial fertilizer, 10-20-20 or approved substitute.

F. Mulch: Unrotted straw free from weeds and course material or other approved product suitable for required application.

G. Mulch Binder: Cutback or emulsified asphalt or synthetic binder such as Petroset, Terratack or Aerospray.

H. Jute Matting: Cloth or Plain weave, undyed and unbleached single jute yarn, 47 to 49 inches wide, averaging 1.15 to 1.26 lbs., per lin. yard loosely twisted construction of not less than 1.6 turns per inch, 78 warp ends per width of cloth and 41 weft ends per lin. yard, meeting the requirements of CC Item 671.

I. Matting Staples; No. 8 plain wire, 6-10 inches long.

J. Commercial Matting Products: Erosionet, Holdgro, Weedcheck, Curlex or approved equal. Product must cover minimum of 30% of soil surface and meeting the requirements of CC Item 671 ODOT Item 671.

PART 3 EXECUTION

3.01 GENERAL

A. Provide temporary and permanent erosion and sediment control items as required by governing agency, as required by permit, as indicated on the plans, as noted in this Specification, and as noted in the Stormwater Pollution Prevention Plan.

3.02 INSTALLATION

A. Install temporary erosion and sediment control items prior to clearing and commencing earthwork or as soon as practical as sitework progresses.

B. Install required permanent erosion and sediment control items as soon as no damage or deterioration will result to those items due to construction activities.

3.03 TEMPORARY ACCESS ROAD AND CONTRACTOR USE AREA

A. Locate access road where indicated or as approved by Owner and local authority having jurisdiction over public roads in vicinity of site. Locate use areas where indicated or as convenient.

B. Access road shall be at least 20 feet wide. All cuts and fill shall be 3:1 or flatter to the extent possible. Drainage ditches shall be provided as needed. The roadbed and use areas surface shall be cleared of all vegetation, roots, and other objectionable material.

C. The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with stone, as conditions demand, and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately.

D. All roadside ditches, cuts, fills and disturbed areas adjacent to use areas and access road shall be stabilized with appropriate temporary vegetation immediately after grading.

E. Both road and use areas may require periodic top dressing with new stone. Seeded areas should be checked periodically to ensure that a vigorous stand of vegetation is maintained. Ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris.

3.04 FILTER FABRIC BARRIERS

A. Construct where indicated or otherwise required by grading operations to reduce sediment content or runoff.

B. The height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.

C. Filter barrier geotextile shall be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints.

D. The stakes shall be spaced a maximum of 3 feet apart at the barrier location and driven securely into the ground (minimum of 8 inches).

E. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stakes and upslope from the barrier.

F. The filter material shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. Heavy duty wire staples at least 1/2 inch long shall be used. Filter materials shall not be stapled to existing trees.

G. The trench shall be backfilled, and the soil compacted over the filter material.

H. If a filter is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends-oriented upslope.

I. Filter barrier shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

J. Filter barrier shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

K. Should the fabric on the filter barrier become ineffective prior to the end of its need, the fabric shall be replaced promptly.

L. Sediment deposits should be removed after each rainfall. They shall be removed when deposits reach approximately one-half the height of the barrier.

M. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared, and seeded.

3.05 ROCK CHANNEL PROTECTION (RCP) PLACEMENT

A. Place RCP on bedding layer, where indicated, to produce a well graded mass of rock with minimum practical percentage of voids.

3.06 TOPSOIL STORAGE AND APPLICATION

A. Stockpile acceptable topsoil generally where indicated and in such a manner that natural drainage is not obstructed, and no off-site sediment damage shall result. Side slopes of the stockpile shall not exceed 2:1.

B. A perimeter dike with gravel outlet, silt fence, or straw bale barrier shall surround all topsoil stockpiles.

C. Temporary seeding of stockpiles shall be completed within seven (7) days of the formation of the stockpile.

D. Before topsoiling, establish indicated and needed erosion and sediment control items such as diversions, berms, dikes, waterways, sediment basin, etc. Previously established grades on the areas to be topsoiled shall be maintained according to the Drawings.

E. After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 2 inches to insure bonding of the topsoil and subsoil.

F. Topsoil shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed sodding or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 3 inches on 3:1 or steeper slopes and 4 inches on flatter slopes. Any irregularities in the surface, resulting from topsoiling or other operations, shall be corrected in order to prevent the formation of depressions or water pockets. Avoid undue compaction.

3.07 TEMPORARY FILL DIVERSION

A. The diversion shall be constructed at the top of the fill at the end of each workday as needed.

B. The diversion shall be located at least 2 feet inside the top edge of the fill.

C. The supporting ridge of the lower side shall be constructed with a uniform height along its entire length.

D. Since the practice is temporary and under most situations will be covered the next workday, the maintenance required should be low. If the practice is to remain in use for more than one day, an inspection will be made at the end of each workday and repairs made to the measure if needed. The Contractor should avoid the placement of any material over the structure while it is in use. Construction traffic should not be permitted to cross the diversion.

3.08 TEMPORARY DIVERSION DIKE

A. Whenever feasible, the dike should be built before construction begins on the project.

B. The dike should be adequately compacted to prevent failure.

C. Temporary or permanent seeding and mulch shall be applied to the dike within fifteen (15) days of construction.

D. The dike should be located to minimize damages by construction operations and traffic.

E. The measure shall be inspected after every storm and repairs made to the dike, flow channel, and outlet, as necessary. Approximately once every week, whether a storm has occurred or not, the measure shall be inspected, and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.

3.09 SEEDING

A. Incorporate lime and 10-20-20 fertilizer into soil prior to seeding. Apply lime at 900 lbs./1000 S.Y. Apply fertilizer at 200 lbs./1000 S.Y. Apply seed at 25 lbs./1000 S.Y. Within 48 hours after any given area is seeded, straw or hay shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre for straw, or 3 tons per acre for hay, when seeding is performed between the dates of March 15 and October 15, and the approximate rate of 3 tons per acre straw, or 4 1/2 tons per acre for hay, when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Provide matting where required to establish seed growth.

B. Areas which fail to establish vegetative cover adequate to prevent rill erosion will be re-seeded as soon as such areas are identified.

3.10 MAINTENANCE

A. Maintain all erosion and sediment control items until final project acceptance. Repair breaches and replace deteriorated or missing items immediately after discovery.

B. In accordance with the Stormwater Pollution Plan (SWPPP) prepared for the project, all stormwater BMPs shall be inspected once every seven (7) days and within 24 hours of a 0.5 inch or greater rainfall. Inspection logs (included herein) shall be kept and shall be submitted to the Owner or Ohio EPA upon request.

C. Clean sedimentation basins and catch basins as required to maintain effectiveness or as otherwise directed.

D. Removal: Remove temporary erosion control items as directed and prior to Project close-out.

END OF SECTION

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

CONSTRUCTION POLLUTION PREVENTION PLAN

<table>
<tr><th colspan="4">SITE DESCRIPTION</th></tr>
<tr><td>Project Name and Location: (Latitude, Longitude, or Address)</td><td>Latitude:
Longitude:</td><td>Owner Name and Address:</td><td></td></tr>
<tr><td>Description: (Purpose and Types of Soil Disturbing Activities)</td><td colspan="3">This project consists of _____.

Soil disturbing activities will include:
• Clearing and grubbing
• Installing stabilized construction entrance
• Perimeter and other erosion and sediment controls
• Grading including detention ponds
• Storm sewers including detention pond outlet with temporary sediment controls
• Construction roads, buildings, etc.
• Final preparation including plantings and seeding</td></tr>
<tr><td>Runoff Coefficient:</td><td colspan="3">The final coefficient for the area of the site will be C = ___. The existing coefficient is C = ___.</td></tr>
<tr><td>Site Area:</td><td colspan="3">The site is approximately ___ acres of which approximately ___ acres will be disturbed by construction.</td></tr>
<tr><td colspan="4">Sequence of Major Activities (Unless otherwise noted, all activities are the responsibility of the General Contractor.)</td></tr>
<tr><td colspan="2">1. Install stabilized construction entrance.
2. Install perimeter erosion control measures where required.
3. Clear and grub.
4. Strip and stock pile topsoil. Seed stock piles.
5. Begin rough grading.
6. Construct detention/sediment basins with outlet protection.
7. Complete rough grading.</td><td colspan="2">8. Install storm sewers and bale inlet filters.
9. Install pavement aggregate base.
10. Construct curb, islands and walks.
11. Complete final paving.
12. Complete fine grading of seeded areas and install permanent seeding and mulching.
13. Remove temporary erosion control measures. Clean sediment from detention basins.</td></tr>
<tr><td>Name of Receiving Waters:</td><td colspan="3">The area tributary to the site flows into _____ which eventually flows to _____.</td></tr>
</table>

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

CONTROLS

Erosion and Sediment Controls

Stabilization Practices

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a stream and not at final grade.	Within two days of the most recent disturbance if the area will Remain idle for more than 21 days.
For all construction activities, any disturbed areas that will be Dormant for more than 21 days but less than one year, and not Within 50 feet of a stream.	Within seven days of the most recent disturbance within the area.
Disturbed areas that will be idle over winter.	Prior to the onset of winter weather.

Temporary Stabilization – Topsoil stock piles will be stabilized with temporary seed and mulch no later than 7 days from the last construction activity in that area. Temporary stabilization must also be applied to any area which will lie idle over the winter. The temporary seed shall be Rye (grass) applied at a rate of 25 lbs. per 1000 S.Y. Prior to seeding, 900 pounds of ground agricultural limestone and 200 pounds of 10-20-20 fertilizer shall be applied to every 1000 S.Y. stabilized. Within 48 hours after any given area is seeded, straw or hay shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre for straw, or 3 tons per acre straw, or 4-1/2 tons per acre for hay, when seeding is performed between the dates of October 15 and March 15 of the succeeding year. Acres to be paved will be temporarily stabilized by applying stone subbase until bituminous pavement can be applied.

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more.	Within seven days of the most recent disturbance.
Any areas within 50 feet of a stream and at final grade.	Within two days of reaching final grade.
Any other areas at final grade.	Within seven days of reaching final grade within that area.

Permanent Stabilization –Permanent seed mix shall consist of 260 lbs/acre of turf Tall Fescue. Prior to seeding, apply commercial fertilizer at the rate of 1 pound actual Nitrogen per 1000 square feet. Fertilizer to have 20:22:14 analysis. After seeding, each area shall be mulched using Turfiber (or equivalent) at a rate of 2000 lbs. per acre with 50 pounds of Turfiber added per 100 gallons of machine capacity. Keep Hydromulch from non-target areas including pavement, plant materials, curbing, and structures. If these surfaces are hit during Hydromulching operations, wash the surface immediately.

Structural Practices

Detention Basin: A detention basin will be constructed for this project. It will collect runoff from approximately ___ acres of the project and discharge into _____. The _____ will carry flow to _____.

Storm Water Management

When construction is complete, stormwater drainage for the developed areas will be provided by a series of inlets connected by storm sewers that will outlet into the detention basin. Storm water will be released at a controlled rate by the outlet structure. The rate was determined by the Local Authority Having Jurisdiction. The areas disturbed, which are not paved, will be permanently seeded.

OTHER CONTROLS

Offsite Vehicle Tracking:

A stabilized construction entrance will be provided to help reduce vehicle tracking of sediments. The paved road adjacent to the site entrance will be swept daily to remove any excess mud, dirt, or rock tracked from the site. Dump trucks hauling material to or from the construction site will be covered with a tarpaulin.

TIMING OF CONTROLS/MEASURES

Areas where construction activity temporarily ceases for more than 21 days will be stabilized with a temporary seed and mulch as soon as possible or within 7 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized within 7 days with permanent seed and mulch. Stripped and stockpiled topsoil should be within 7 days using temporary stabilization seed mix, as described above. After all topsoil has been used the remaining stockpiled topsoil should be seeded using the permanent stabilization method as noted.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The storm water pollution prevention plan reflects Federal and State Requirements for storm water management and erosion and sediment control. To ensure compliance, this plan was prepared in accordance with the Storm Water Management for Construction Activities published by the EPA.

MAINTENANCE/INSPECTION PROCEDURES

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls.

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order, if a repair is necessary, it will be initiated within 24 hours of report.
- Built up sediment will be removed from silt fence when it has reached one-third of height of fence.
- Silt fence will be inspected for depth of sediment tears, to see if fabric is securely attached to the fence posts and to see that the fence post be firmly in the ground.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection.
- Personnel selected for inspection and maintenance responsibilities will receive training from the Site Superintendent. They will be trained in all inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharges

It is expected that the following non-storm water discharges will occur from the site during the construction period:

- Water from water line flushings.
- Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
- Uncontaminated groundwater (from dewatering excavation). All dewatering discharges shall be effectively treated prior to release. No turbid discharges are permitted.

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction.

- Concrete
- Detergents
- Paints (enamel and latex)
- Metal Studs
- Concrete
- Tar
- Fertilizers
- Petroleum Based Products
- Cleaning Solvents
- Wood
- Masonry Block

SPILL PREVENTION

Material Management Practices

The following are the material management practices that will be used for reducing the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data will be retained; they contain important product information.

If surplus product must be disposed of, manufacturers or local and State recommended methods for proper disposal will be followed.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products:

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any asphaltic substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizers will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or State and local regulations.

SPILL PREVENTION (Continued)

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods of spill cleanup will be clearly posted and site personnel will be aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are sufficient penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owners Representative

Name (Print): _____

Title: _____

Signature: _____

Date: _____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signature	For	Responsible for
Date: _____ Print Name: _____		

Construction Site Inspection Checklist for OHC000005

By making use of some simple Best Management Practices (BMPs) a construction site operator can do his or her share to protect Ohio's water resources from the harmful effects of sediment. The topography of the site and the extent of the construction activities will determine which of these practices are applicable to any given site, but the BMPs listed here are applicable to most construction sites. For details on the installation and maintenance of these BMPs, please refer to the current ***Rainwater and Land Development***, *Ohio EPA's Standards for Storm Water Management Land Development and Urban Stream Protection*. The manual is available at http://epa.ohio.gov/dsw/storm/technical_guidance.

Temporary Stabilization

This is the most effective BMP. All disturbed areas that will lie dormant for over 14 days must be stabilized within 7 days of the date the area becomes inactive. The goal of temporary stabilization is to provide cover, quickly. Areas within 50 feet of a stream must be stabilized within 2 days of inactivity. This is accomplished by seeding with fast-growing grasses then covering with straw mulch. Apply only mulch between November 1 and March 31. To minimize your costs of temporary stabilization, leave natural cover in place for as long as possible. Only disturb areas you intend to work within the next 14 days.

Construction Entrances

Construction entrances are installed to minimize off-site tracking of sediments. A stone access drive should be installed at every point where vehicles enter or exit the site. Every individual lot should also have its own drive once construction on the lot begins.

Sediment Ponds

Sediment ponds are required for construction areas with concentrated runoff or when the design capacity of silt fence or inlet protection is exceeded. There are two types of sediment ponds: sediment basins and sediment traps. A sediment trap is appropriate where the contributing drainage area is 5 acres or less. The outlet is an earthen embankment with a simple stone spillway. A sediment basin is appropriate for drainage areas larger than 10 acres. The outlet is an engineered riser pipe with a skimmer or similar device used to dewater the pond at the surface. Often a permanent storm water management pond, such as a retention or detention basin, can be modified to act as a sediment basin during construction. All sediment ponds must be installed within 7 days of first grubbing the area they control, provide a minimum dewatering zone of 67 cubic yards per acre of total contributing drainage area and a sediment settling zone of
34 cubic yards per disturbed acre below the level of the outlet. Sediment basins must be designed to drain the dewatering zone over a 48-hour period.

Sediment Barriers

This is typically used at the perimeter of a disturbed area. It's only for small drainage areas on relatively flat slopes or around small soil storage piles. Not suitable where runoff is concentrated in a ditch, pipe or through streams. For large drainage areas where flow is concentrated, collect runoff in diversion berms or channels and pass it through a sediment pond prior to discharging it from the site. Combination barriers constructed of silt fence supported by straw bales or silt fence embedded within rock check dams may be effective within small channels. As with all sediment controls, sediment barriers must be capable of pooling runoff so that sediment can settle out of suspension. Sediment barriers must be installed within 7 days of first grubbing the area it controls.

Inlet Protection

This must be installed on all yard drains and curb drains when these inlets do not drain to a sediment trap or basin. Even if there is a sediment trap or basin, inlet protection is still recommended, as it will increase the overall sediment removal efficiency. These are best used on roads with little or no traffic. If working properly, inlet protection will cause water to pond. If used on curb inlets, streets will flood temporarily during heavy storms. Check with your municipality before installing curb inlet protection. They may prefer an alternate means of sediment control such as silt fence or ponds.

Permanent Stabilization

All areas at final grade must be permanently stabilized within 7 days of reaching final grade. This is usually accomplished by using seed and mulch, but special measures are sometimes required. This is particularly true in drainage ditches or on steep slopes. These measures include the addition of topsoil, erosion control matting, rock rip-rap or retaining walls. Permanent seeding should be done March 1 to May 31 and August 1 to September 30. Dormant seeding can be done from November 20 to March 15. At all other times of the year, the area should be temporarily stabilized until a permanent seeding can be applied.

Non-Sediment Pollution Control

Although sediment is the pollutant of greatest concern on most construction sites, there are other sources of pollution. Most of these BMPs are easy to implement with a little bit of planning and go a long way toward keeping your site clean and organized. Please be sure to inform all contractors how these BMPs affect their operations on the site, particularly those that will be working near a stream.

Inspection Sheet

INSPECTIONS MUST BE CONDUCTED ONCE EVERY 7 DAYS AND WITHIN 24 HOURS OF A 0.5" OR GREATER RAINFALL. ALL SEDIMENT CONTROLS MUST BE INSTALLED PRIOR TO GRADING AND WITHIN 7 DAYS OF FIRST GRUBBING

GENERAL INSPECTION INFORMATION

Construction Site Inspection Date:_____ Inspector Name: _____

Inspector Title:_____ Qualifications/Certifications:_____

Storm Events of the Last 7 Days

Storm Event Date	Storm Event Time	Storm Event Duration	Total Rainfall Amount	Discharge Occur? (Y/N)
			(inches)	
			(inches)	
			(inches)	
			(inches)	

Weather Information at the Time of Inspection

Sketch or Small Site Map

Along with a narrative inspection log, Ohio EPA recommends the inspector use a sketch or a reduced photocopy of the site plan showing the location of storm water outfalls and storm drain inlets as well as the location and types of control measures. Problems observed at these locations, or at other locations on the construction site, should be highlighted and any corrective measures undertaken should be drawn in and noted in detail on the front side of the sketch. This method will also be helpful as the permittee is required to update the SWP3 to reflect current site conditions.

CONSTRUCTION ENTRANCES

Key things to look for ...

	Yes	No
1. Has the drive been constructed by placing geotextile fabric under the stone?	☐	☐
2. Is the stone 2-inch diameter?	☐	☐
3. Has the stone been placed to a depth of 6 inches, with a width of 10 feet and a length of at least 50 feet (30 feet for entrances onto individual sublots)?	☐	☐
4. If the drive is placed on a slope, has a diversion berm been constructed across the drive to divert runoff away from the street or water resource?	☐	☐
5. If drive is placed across a ditch, was a culvert pipe used to allow runoff to flow across the drive?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

SEDIMENT PONDS

Key things to look for ...

		Yes	No
1.	Are concentrated flows of runoff directed to a sediment pond?	☐	☐
2.	Is sheet-flow runoff from drainage areas that exceed the design capacity of silt fence (generally 0.25 acre or larger) directed to a sediment pond?	☐	☐
3.	Is runoff being collected and directed to the sediment pond via the storm sewer system or via a network of diversion berms and channels?	☐	☐
4.	Is the sediment pond dewatering zone appropriately sized (67 cubic yards per acre of total drainage area)?	☐	☐
5.	Is the sediment pond sediment settling zone appropriately sized (34 cubic yards per acre of disturbed area)?	☐	☐
6.	Is the sediment basin designed to be dewatered at the surface through the use of a skimmer or another similar surface water dewatering device?	☐	☐
7.	Is the sediment basin designed so that the dewatering zone will drain in no less time than 48 hours?	☐	☐
8.	Have the embankments of the sediment pond and the areas that lie downstream of the pond been stabilized?	☐	☐
9.	For sediment traps, is there geotextile under the stone spillway and is the spillway saddle-shaped?	☐	☐
10.	For sediment traps, which dewater 100% between storms, is the dewatering pipe end-capped, no larger than 6 inches in diameter, perforated and double-wrapped in geotextile?	☐	☐
11.	Is the length-to-width ratio between inlet(s) and outlet at least 2:1? **NOTE**: If not, a baffle should be added to lengthen the distance.	☐	☐
12.	Is the depth from the bottom of the basin to the top of the primary spillway no more than 3 to 5 feet?	☐	☐
13.	For a modified storm water pond being used as a sediment pond, is the connection between the riser pipe and the permanent outlet water-tight?	☐	☐
14.	Was the basin installed prior to grading the site?	☐	☐
15.	Is it time to clean-out the sediment pond to restore its original capacity? Generally, sediment should be removed from the sediment settling zone once it's half-full. Stabilize the dredged sediments with seed and mulch.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

SEDIMENT BARRIERS

Key things to look for ...

	Yes	No
1. Is the silt fence at least 4" to 6" into the ground?	☐	☐
2. Is the silt fence trench backfilled to prevent runoff from cutting underneath the fence?	☐	☐
3. Is the silt fence pulled tight so it won't sag when water builds up behind it?	☐	☐
4. Are the ends brought upslope of the rest of the silt fence so as to prevent runoff from going around the ends?	☐	☐
5. Is the silt fence placed on a level contour? If not, the fence will only act as a diversion.	☐	☐
6. Have all the gaps and tears in the silt fence been eliminated.	☐	☐
7. Is the sediment barrier controlling an appropriate drainage area? Refer to Chapter 6 of ***Rainwater*** manual. **RULE OF THUMB**: Design capacity for 100 linear feet of sediment barrier is 0.5 acres for slopes < 2%, 0.25 acres for slopes 2% to 20%, & 0.125 acres for slopes 20% or more. Generally, no more than 0.25 acres should lie behind 100 feet of sediment barrier at 2% to 20% slope, i.e., the distance between the barrier and the top of the slope behind it should be no more than 125 feet. The allowable distance increases on flatter slopes and decreases for steeper slopes. **All non-silt fence sediment barriers must be at least 12-inches in diameter.**	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

INLET PROTECTION

Key things to look for ...

	Yes	No
1. Does water pond around the inlet when it rains?	☐	☐
2. Has the fabric been replaced when it develops tears or sags?	☐	☐
3. For curb inlet protection, does the fabric cover the entire grate, including the curb window?	☐	☐
4. For yard inlet protection, does the structure encircle the entire grate?	☐	☐
5. Is the fabric properly entrenched or anchored so that water passes through it and not under it?	☐	☐
6. For yard inlet protection, is the fabric properly supported to withstand the weight of water and prevent sagging? The fabric should be supported by a wood frame with cross braces, or straw bales.	☐	☐
7. Is sediment that has accumulated around the inlet removed on a regular basis?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

TEMPORARY STABILIZATION

Key things to look for ...

	Yes	No
1. Are there any areas of the site that are disturbed, but will likely lie dormant for over 14 days?	☐	☐
2. Have all dormant, disturbed areas been temporarily stabilized in their entireties?	☐	☐
3. Have disturbed areas outside the silt fence been seeded or mulched?	☐	☐
4. Have soil stockpiles that will sit for over 14 days been stabilized?	☐	☐
5. Has seed and mulch been applied at the proper rate? In general, seed is applied at 3 to 5 lbs per 1000 sq ft and straw mulch is applied at 2-3 bales per 1000 sq ft.	☐	☐
6. Has seed or mulch blown away? If so, repair.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

_____

_____

PERMANENT STABILIZATION

Key things to look for ...

	Yes	No
1. Are any areas at final grade?	☐	☐
2. Has the soil been properly prepared to accept permanent seeding?	☐	☐
3. Has seed and mulch been applied at the appropriate rate (see Chapter 7 of the ***Rainwater*** manual)?	☐	☐
4. If rainfall has been inadequate, are seeded areas being watered?	☐	☐
5. For drainage ditches where flow velocity exceeds 3.5 ft/s from a 10-year, 24-hour storm has matting been applied to the ditch bottom?	☐	☐
6. If the flow velocity exceeds 5.0 ft/s, has the ditch bottom been stabilized with rock rip-rap? **NOTE**: Rock check dams may be needed to slow the flow of runoff.	☐	☐
7. Has rock rip-rap been placed under all storm water outfall pipes to prevent scouring in the receiving stream or erosion of the receiving channel?	☐	☐
8. For sites with steep slopes or fill areas, is runoff from the top of the site conveyed to the bottom of the slope or fill area in a controlled manner so as not to cause erosion?	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

_____

_____

NON-SEDIMENT POLLUTION CONTROL

Key things to look for ...

	Yes	No
1. Has an area been designated for washing out concrete trucks? Washings must be contained on site within a bermed area until they harden. The washings should never be directed toward a watercourse, ditch or storm drain.	☐	☐
2. Is waste and packaging disposed of in a dumpster? Do not burn them on site.	☐	☐
3. Are fuel tanks and drums of toxic and hazardous materials stored within a diked area or trailer and away from any watercourse, ditch or storm drain?	☐	☐
4. Are streets swept as often as necessary to keep them clean and free from sediment? NOTE: Sediment should be swept back onto the lot - not down the storm sewers.	☐	☐
5. Are stockpiles of soil or other materials stored away from any watercourse, ditch or storm drain?	☐	☐
6. Have stream crossings been constructed entirely of non-erodible material?	☐	☐
7. If an area of the site is being dewatered, is it being pumped from a sump pit or is the discharge directed to a sediment pond? **NOTE**: if you must lower ground water, the water may be discharged to the receiving stream as long as the water remains clean. Be sure not to co-mingle the clean ground water with sediment-laden water or to discharge it off-site by passing it over disturbed ground.	☐	☐

Note areas where repairs or maintenance is needed or where this practice needs to be applied:

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

Division of Surface Water - *Notice of Termination (NOT) of Coverage Under Ohio Environmental Protection Agency General NPDES Permit*

(Read accompanying instructions carefully before completing this form.)

Submission of this NOT constitutes notice that the party identified in Section II of this form is no longer authorized to discharge into state waters under the NPDES general permit program. NOTE: All necessary information must be provided on this form. Do not use correction fluid on this form. Forms transmitted by fax will not be accepted. There is no fee associated with submitting this form.

I. Permit Information

NPDES General Permit Number: OH

Facility General Permit Number:

II. Owner/Applicant Information/Mailing Address:

Company (Applicant) Name:

Mailing (Applicant) Address:

City:	**State:**	**Zip Code:**

Contact Person:	**Phone:**	**Fax:**

Contact E-mail Address:

III. Facility/Site Location Information

Facility Name:

Facility Address/Location:

City:	**State:**	**Zip Code:**

County:	**Township:**	**Section:**

Facility Contact Person:	**Phone:**	**Fax:**

Contact E-mail Address:

IV. Reason for Termination

Transfer of Ownership ☐	**Cease to Discharge** ☐	**Facility Closed** ☐
Project Completed ☐	**Obtained Individual Permit** ☐	

V. Certifications

Standard Certification:

I certify under penalty of law that all discharges authorized by the NPDES general permit have been eliminated or that I am no longer the operator of the facility. I understand that by submitting this NOT, I am no longer authorized to discharge under this general permit and that discharging pollutants to waters of the state without an NPDES permit is unlawful under ORC 6111.

Name *(typed)*:	**Title:**
Signature:	**Date:**

Industrial Storm Water and Coal Mining Activity Certification Only:

I certify under penalty of law that all discharges associated with the identified facility that are authorized by the above referenced NPDES general permit have been eliminated, that I am no longer the operator of the facility, or in the case of a coal mine that the SMCRA bond has been released by ODNR-Division of Reclamation. I understand that by submitting this NOT, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity to waters of the state is unlawful under ORC 6111 where the discharge is not authorized by an NPDES permit.

Name *(typed)*:	**Title:**
Signature:	**Date:**

Storm Water Construction Activity Certification Only:

I certify under penalty of law that all elements of the storm water pollution prevention plan have been completed, the disturbed soil at the identified facility have been stabilized and temporary erosion and sediment control measures have been removed at the appropriate time, or that all storm water discharges associated with construction activity from the identified facility that are authorized by the above referenced NPDES general permit have otherwise been eliminated. I understand that, by submitting this NOT, I am no longer authorized to discharge storm water associated with construction activity by the general permit, and that discharging pollutants in storm water associated with construction activity to waters of the state is unlawful under ORC 6111 where the discharge is not authorized by an NPDES permit.

Name *(typed)*:	**Title:**
Signature:	**Date:**

BICENTENNIAL BARN – MCCAMMON CREEK PARK
6844 Bale Kenyon Road
Lewis Center, OH 43035

Notice of Termination (NOT) Form Instructions For Ohio EPA General Permits

Where to file NOT form

NOTs must be sent to the following address:

Ohio Environmental Protection Agency
General Permit Program
P.O. Box 1049
Columbus, OH 43216-1049

Completing the Form

Please complete the fill-in form on-line at www.epa.ohio.gov/dsw/storm/stormform.aspx or print legibly in the appropriate areas only. Forms transmitted by FAX will not be accepted. Complete all sections of the NOT form. Incomplete forms will be returned to the applicant for resubmittal.

Please place each character slightly above the appropriate line. Abbreviate if necessary to stay within the space allowed for each item.

Section I - Permit Information

Enter the existing Ohio NPDES general permit number assigned to the facility or site for which you are submitting this NOT. If you do not know the permit number, contact the Ohio EPA Storm Water Section at (614) 644-2001.

Section II - Owner/Applicant Information/Mailing Address

This information should appear on the NOT form as it appears on the original Notice of Intent (NOI) form.

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in the application. The name of the operator may or may not be the same as the facility. The operator of the facility is the legal entity which controls the facility's operation rather than the plant or site manager. For construction activities, the responsible party is the owner or the developer of the property. Do not use a colloquial name. Give the name and phone number of a contact person who is responsible for addressing NPDES permit requirements. Enter the complete address and telephone number of the operator (provide phone number as: area code exchange number).

Section III - Facility/Site Location Information

This information should appear on the NOT form as it appears on the original Notice of Intent (NOI) form.

Enter the facility's or site's official or legal name and complete address, including city, state, zip code, county, township, and section. If the facility lacks a street address, indicate the street name and approximate address number.

Section IV - Reason for Termination

Indicate your reason for submitting this NOT by placing an "x" on the appropriate space. You may indicate more than one reason.

Standard Certification

The standard certification should be completed except where a specific certification (listed below) is required.

Industrial Storm Water and Coal Mining Activity Certification Only

This certification should be completed only if you are submitting this NOT to terminate permit coverage under the storm water general permit associated with industrial activity or the general permit associated with coal mining activity.

Construction Certification Only

This certification should be completed only if you are submitting this NOT to terminate permit coverage under the storm water general permit associated with construction activity.

Note for all certifications: provide date as month day year using 2 digits for each space.

Signatory Requirements

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows.

For a corporation; by a responsible corporate officer, which means: (1) a president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship; by a general partner or the proprietor; or

For a municipality, state, federal, or other public facility; by either a principal executive officer or ranking elected official

SECTION 32 12 00
FLEXIBLE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Asphalt concrete pavement shown on the Drawings and required by the Specifications constructed on a prepared surface in reasonably close conformity with the lines, grades, and typical cross sections shown on the plans or otherwise specified.

B. Coordinate work of other trades who will be working adjacent to paving areas. Coordinate work with Contractor providing compacted base for paving materials.

C. Inspection and Testing Services required by this Section are to be performed by an Agency retained by the Contractor and approved by the Owner. This includes all field sampling and testing required by the Field Quality Control Section of this Specification.

D. Related Sections:
1. Section 31 00 00, "Earthwork"
2. Section 31 23 33, "Piped Utilities - Basic Methods"
3. Section 32 13 00, "Rigid Pavement"
4. Section 03 30 00, "Cast-in-Place Concrete"

E. Do not place asphalt surface course until site work has been completed and construction traffic has been reduced to a minimum.

1.02 QUALITY ASSURANCE

A. Reference Standards:
1. The Asphalt Institute – Manual MS-2 – Mix Design Methods.
2. The Asphalt Institute – Manual MS-4 – The Asphalt Handbook.
3. The Asphalt Institute – Manual MS-13 – Asphalt Surface Treatments and Asphalt Penetration Macadam.
4. ASTM D946 – Asphalt Cement for Use in Pavement Construction.
5. ASTM D1188 – Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures using Paraffin Coated Specimens.
6. ASTM D2041 – Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
7. ASTM D2950 – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
8. State of Ohio, Department of Transportation – Construction and Materials Specifications (CMS) 2019.
9. City of Columbus, Ohio - Construction and Material Specifications (CCMS) 2018.

B. Regulatory Requirements:
1. Conform to applicable City standards for paving work on public property. In the event of a conflict between the Drawings and Specifications and the City standards, the City standards shall govern. No extra charges will be allowed for any changes necessary for compliance with City standards.

2. Perform work in accordance with State of Ohio, City of Columbus, Department of Transportation Construction and Material Specifications, 2019.
3. Mixing Plant: Conform to State of Ohio, City of Columbus, Department of Transportation, Construction and Material Specifications, 2019.

C. Weather Limitations:
1. Place bituminous pavement only when the surface is dry and when weather conditions are such that proper handling, finishing and compaction can be accomplished. In no case, however, shall bituminous pavement be placed when the surface temperature is below the minimum established in the following table:

COURSE THICKNESS	MINIMUM SURFACE TEMPERATURE
1.5 Inches and Over	40°F
1.0 to 1.4 Inches	50°F
Less than 1.0 Inches	60°F

1.03 SUBMITTALS

A. Submit for approval the mixing plant to be used.

B. Submit approved job mix formulas for each asphalt concrete pavement prior to preparation of the mixture.

C. Submit all aggregate and asphalt binder test data, as required.

D. Submit product data and manufacturers instructions, including traffic paint.

E. Submit for approval the name of agency proposed for the required inspection and testing services. All of the required field testing and sampling is to be performed by personnel employed by the proposed agency.

F. Submit reports of all required testing and inspection.

PART 2 PRODUCTS

2.01 MATERIALS

A. Surface Course: ODOT Item 441, Asphalt Concrete Surface Course, Type 1, medium or light traffic, PG 64-22.
1. Refer to drawings and details for extent of medium and light traffic designations.

B. Intermediate Course: ODOT Item 446, Asphalt Concrete Surface Course, Type 2, medium or light traffic, PG 64-22.
1. Refer to drawings and details for extent of medium and light traffic designations.

C. Tack Coat: ODOT Item 407.

D. Bituminous Aggregate Base Course: ODOT Item 301, Asphalt Concrete Base, PG 64-22.

E. Aggregate Base Course: ODOT Item 304.

2.02 EQUIPMENT

A. Spreading Equipment: Provide self-contained spreading equipment of sufficient size, power, and stability to receive, distribute, and strike-off the bituminous mixture at rates and widths commensurate with the typical sections and other details shown on the plans. Provide equipment with automatic control systems which maintain the screed in a constant position relative to profile and cross-slope references. These references shall be such that control of the screed position is reasonably independent of irregularities in the underlying surface and of the spreader operation.

B. Rollers: Provide rollers of the standard steel wheel and pneumatic tire types and meeting the requirements of ODOT Item 401.13.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade base is dry and ready to support paving and imposed loads.

B. Proof roll subgrade and correct any areas determined unacceptable to Testing Agency, in accordance with the Agency's recommendations immediately prior to placement of asphalt pavement.

C. Verify gradients and elevations of base are correct.

D. Beginning of installation means acceptance of substrate.

E. Protect existing surfaces and structures adjacent to paving. Repair any damage caused by paving operations at no additional cost to the Owner.

3.02 CONDITIONING EXISTING SURFACE

A. Immediately prior to the arrival of pavement mixtures, thoroughly clear the pavement base, leveling course, or old pavement of all soil, grass, dirt, or other foreign materials.

B. When the surface of the existing pavement is irregular, bring to uniform grade as directed using the material specified. Paint contact surfaces of curbing, gutters, manholes, and other structures with a thin, uniform coating of bituminous material prior to the bituminous mixture being placed against them.

C. Where mixture is to be placed against the vertical face of rigid pavement, clean vertical face of foreign material and give an application of bituminous material in a manner which results in a coating of approximately 1/4 gallon per square yard.

D. Coat surfaces of catch basin frames with oil to prevent bond with asphalt paving.

3.03 PAVEMENT REPAIR

A. Saw cut perimeter of pavement repair. Extend saw cut fully through the existing surface and asphaltic base material, enabling the removal of the existing failed pavement, leaving a neat and straight edge.

B. Completely excavate the existing pavement section in areas of repair and remove from the site. Use excavating equipment which shall not damage existing pavement to remain.

C. In the event that the entire pavement section is removed, proof roll the area. Undercut and replace any existing subbase that is soft and yielding with ODOT CCMS Item 304. Remove all unsuitable subgrade material excavated from the pavement repair area from the site. Proof roll in the presence of the Associate / Engineer / Testing Agency. Payment shall be made per contract conditions relative to changes in work. / Payment shall be made on the bases of unit price established.

D. Where mixture is to be placed against the vertical face of an existing pavement structure, clean the vertical face of foreign material and give an application of tack coat.

3.04 PAVEMENT RESURFACING

A. Coordinate junction of new and existing pavement. Where new overlay abuts existing pavement, scarify a minimum of 4 feet wide and depth equal to overlay thickness to provide butt joint. Feathering will not be permitted.

B. Scarify areas around existing structures 4'-0" wide, such that the new overlay will be placed to meeting existing surface level. Scarify other areas of overlay as shown on the Drawings. Maintain positive drainage slopes.

C. Scarify by milling, grinding or cold planning the existing pavement surface to establish a new surface profile and cross section in preparation for the asphaltic overlay. Provide a surface after grinding that is grooved or ridged finish uniform and resistant to raveling or traffic displacement. Provided a textured surface that has grooves of 0.25 inches in width.

D. Include grinding around utility castings in the area of the pavement scarified. The At Contractor's option remove the entire existing bituminous pavement around the castings where grinding is not completed and replace it with bituminous surface course placed and compacted in 3 inch lifts. Vertically cut the limits of the area to be patched, mechanically compact the existing base course and prime the bottom and vertical edges before backfilling.

E. Provide a power operated, self-propelled grinding machine with a cutting drum with lacing patterns that will attain a grooved surface and produce a pressurized watering system for dust control.

F. Thoroughly clean all areas to be resurfaced. Do not flush cleanup water into the storm sewer system. Remove waste debris cleaned from the site.

G. Provide asphaltic concrete overlay in areas of resurfacing according to the Drawings and this entire Specification Section, as applicable.

3.05 PREPARATION, MIXING, AND HAULING OF MIXTURE:

A. Preparation:
1. Bituminous Material Preparation: Heat bituminous material and deliver to the mixer within the temperature range specified in ODOT CCMS Item 702. Do not use foaming bituminous materials.
2. Aggregate Preparation: Feed aggregates to the cold elevator in their proper proportions at a rate permitting correct and uniform control of heating and drying. Remove all aggregates in the hot bins that will produce a mix outside the temperature limits or that contain sufficient moisture or expanding gases to cause foaming in the mixture and return to the proper stockpiles.

B. Mixing:
1. After all of the aggregate is in the mixer, add bituminous material in an evenly spread sheet over the full length of the mixer. The mixing time shall be the time interval between the start of the application of the bituminous material and the opening of the mixer gate. Mix bituminous material for a minimum of 30 seconds. Discharge all bituminous material in no more than 30 seconds.
2. Maintain temperatures of the mixture at the plant in order to be placed at the temperatures specified in Paragraph 3.06.

C. Hauling:
1. Use trucks for hauling bituminous mixtures that have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of approved material to prevent the mixture from adhering to the beds. Provide each truck a securely fastened, waterproof cover of suitable material to adequately protect the mixture from the wind and weather. Remove covers prior to dumping mixture into the paver.
2. When hot mixtures are being transported at prevailing air temperatures below 50º F or when the length of haul exceeds 20 miles, insulate all truck beds to maintain the specified temperature of the mixture. Do not haul distances in excess of 50 miles unless specifically approved by the Engineer.

3.06 SPREADING

A. Place tack coat prior to placing surface course or intermediate course per ODOT Item 407.

B. Spread the pavement mixture on an approved surface with bituminous pavers or spreaders to achieve the specified thickness and compaction. Maximum compacted depth of any one layer shall be as follows:
1. Aggregate Base Course: 8 inches
2. Bituminous Aggregate Base Course: 6 inches
3. Intermediate Course: 3 inches
4. Surface Course: 3 inches

C. Immediately after the mixture is spread, correct irregularities in grade and alignment by the addition or removal of the mixture before compaction has started.

D. Remove and replace any areas showing an excess or deficiency of bituminous material before or after compaction.

E. In areas where irregularities or unavoidable obstacles make the use of mechanical spreading equipment impracticable, spread or rake the mixture with hand tools. For such areas, dump, spread, and screen the mixture to give the specified thickness and compaction.

3.07 COMPACTION

A. Provide a bituminous mixture with a minimum temperature of 270 degrees F prior to placing in the paver. Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, thoroughly and uniformly compact by rolling.

B. Coordinate the spreading of the mixture with the required roller coverage, considering the rate of cooling of the mixture as affected by lift thickness and environmental conditions. Complete final rolling before the pavement reaches a temperature of 180 degrees F.

C. Along curbs, headers, walls, and in other areas not accessible to rollers, thoroughly compact the mixture with hot, hand tampers or with mechanical tampers.

D. For all hot bituminous mixtures, provide the number and type of rollers sufficient to compact the mixture at the rate of spreading without exceeding the capacity of the rollers in operation. Compact base, intermediate, and surface courses with a combination of both steel and Type I pneumatic tire rollers, except in small areas which may be compacted by hand tools.

E. Unless otherwise directed, begin rolling at the outer edges and proceed longitudinally at a slow, uniform speed. After each coverage or complete round trip, progress the roller by overlapping the previous pass by at least half of the width of the roller.

F. Continue rolling until full coverage of the course has been completed and all roller marks are eliminated.

G. Replace mixture that becomes loose, broken, contaminated, or otherwise defective with fresh, hot mixture compacted to conform with the surrounding area.

H. After compaction of the surface course, seal curbs and gutters with asphalt binder. Apply mixture at a uniform width and at a rate just sufficient to fill surface voids.

I. Do not allow traffic to travel on the compacted pavement until it has cooled sufficiently to prevent glazing.

3.08 JOINTS

A. Place bituminous paving as continuously as possible. Make longitudinal and transverse joints as a vertical face. Set up joints at the proper height above the adjacent finished pavement to receive maximum compaction.

B. Provide a well bonded and sealed joint. Coated joint with a 4 inch wide strip of asphalt material along the entire length of the joint.

3.09 TRAFFIC PAINT

A. Paint all lines, arrows and other markings in accordance with ODOT Section 640 as required to define parking spaces and traffic flow on pavement as indicated on Drawings. Provide handicapped logos at all handicapped parking spaces.

B. Paint lines approximately 4 inches wide with even, clean edges and neat, sharp lines.

C. Apply by highway-type applicator machine in heavy one-coat application in method and coverage recommended by paint manufacturer. Do not hand paint any lines.

D. Apply traffic paint at the completion of the project when no more construction traffic is expected in the area.

3.10 SPREADING AND SURFACE TOLERANCES

A. Maintain the rate of spreading within a tolerance of 5 percent of the required calculated weight to achieve proper course depth and compaction.

B. Do not vary elevation of finished surface course from true elevation by more than 1/4 inch.

C. Do not vary transverse slope of the surface of the completed course from the specified slope by more than 3/8 inch in 10 feet.

D. Do not vary transverse slope of the surface of the completed course from the testing edge of a 10 foot straightedge by more than the tolerance specified:
   1. Bituminous Aggregate Base course: 3/8 inch.
   2. Intermediate course: 1/4 inch.
   3. Surface course: 1/4 inch.

E. Remove and replace portions of the completed pavement that are defective in surface, compression, or composition or otherwise correct in a manner satisfactory to the Engineer.

3.11 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Bituminous Thickness Testing: Provide thickness measurement of field core samples per ASTM D1188 within 48 hours after the pavement is placed. Perform tests as follows:
   1. One passing thickness test for each 500 square yards or each lift, whichever is less.
   2. Provide random locations of cores or as directed by the Associate / Engineer or Testing Agency. Clearly identify horizontal location at each test core on test reports.
   3. Allowable compacted pavement thickness shall be within + 0.25 inches of specified thickness.
   4. Fill core holes by the next working day. Before filling, ensure the holes are dry and tack with asphalt material conforming to ODOT CCMS Item 407.02. Properly compact the asphalt concrete used to fill the hole leave flush with adjacent pavement.

C. Bituminous Density Testing: Provide density testing of placed bituminous pavement per ASTM D1188 and ASTM D2950 within 48 hours after the pavement is placed. Theoretical average Maximum Specific Gravity (MSG) shall be determined per ASTM D2041. Perform tests as follows:
   1. One passing density test for each 500 sq. or each lift, whichever is less.
   2. Provide random locations of tests or as directed by Associate / Engineer or Testing Agency. Test reports shall clearly identify horizontal location at each test location.
   3. Provide compaction ranging from 90.0 to 97.9 percent of the average Maximum Specific Gravity (MSG) for Surface Course and 90.0 to 96.9 percent for Intermediate Course. Remove and replace any material placed outside of said ranges. Provide replacement pavement and quality assurance testing at no additional cost to the Owner.
   4. Fill core holes by the next working day. Before filling, ensure the holes are dry and tack with asphalt material conforming to ODOT CCMS Item 407.02. The asphalt concrete used to fill the hole shall be properly compacted and shall be left flush with adjacent pavement.

3.12 ACCEPTANCE

A. Asphalt surface not conforming to sections "Spreading and Surface Tolerances" and "Field Quality Control" and/or exhibiting ponding after rain events are subject to rejection and removal and replacement at no cost to the Owner.

B. When Field Quality Control testing or observations indicate that the Contract requirements have not been met, the Contractor is to bear the costs of any additional testing any analysis to determine acceptability and also the cost of removal and replacement, if such is required.

3.13 PROTECTION

A. Immediately after placement, protect pavement under provisions of Division 1 from mechanical injury. Maintain clean pavement surface throughout the remainder of the project. Immediately remove any construction debris or soil tracked on new asphalt.

B. If pavement surface becomes faded or dirty prior to completion of project, clean and seal parking lot prior to applying traffic paint.

C. Protection of Work by Others: Protect all work by others such manholes, catch basins, sewer cleanouts, lighting posts and bases, sidewalks, etc. Damage to same shall be repaired at the Paving Contractor's expense.

END OF SECTION

SECTION 32 13 00
RIGID PAVEMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Concrete sidewalks, detectable warnings, curbs, gutters, and streets.

B. Reinforcement.

C. Surface finish.

D. Curing

1.02 WORK INSTALLED BUT FINISHED UNDER OTHER SECTIONS

A. Not used.

1.03 RELATED WORK

A. Section 31 00 00, "Earthwork"

B. Section 32 12 00, "Flexible Pavement"

C. Section 33 40 00, "Storm Drainage"

D. Section 03 30 00, "Cast-in-Place Concrete"

1.04 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM A185-02 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

C. ASTM A497-02 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

D. ASTM D1751-99 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

E. ASTM D1752-04a – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

F. ASTM C33-03 - Standard Specification for Concrete Aggregates.

G. ASTM C94-04a - Standard Specification for Ready Mixed Concrete.

H. ASTM C150-04a - Standard Specification for Portland Cement.

I. ASTM C260-01 - Standard Specification for Air-Entraining Admixtures for Concrete.

J. ASTM C309-03 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

K. ASTM C494-04 - Standard Specification for Chemical Admixtures for Concrete.

L. ASTM C920-02 – Standard Specification for Elastomeric Joint Sealants.

M. ASTM D5249 – Standard Specification for Backer Material for Use with Cold and Hot Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints.

N. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

O. State of Ohio Department of Transportation Construction and Material Specifications (CMS) 2019.

P. City of Columbus, Ohio Construction and Material Specifications (CCMS) 2018.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

C. Install curb and gutter in accordance with ODOT Item 609.

1.06 REGULATOR REQUIREMENTS

A. Conform to City code for paving work on public property.

1.07 TESTS

A. Testing and analysis will be performed under provisions of Division 1.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

1.08 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include data on joint filler, admixtures, curing compounds.

C. Submit manufacturer's instructions under provisions of Division 1.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150-86, Type I, II or III Portland type, gray color.

B. Fine and Coarse Aggregate: ASTM C33-86.

C. Water: Potable.

2.02 FORM MATERIALS

A. Conform to ACI 301.

B. Joint Filler: ASTM D1751-83.

2.03 REINFORCEMENT

A. Reinforcing Steel: ASTM A615; 60 ksi yield grade.

B. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A175; in flat sheets.

C. Tie Wire: Annealed steel, minimum 16 gauge.

D. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finished.

E. Synthetic Fiber Reinforcement: ASTM C1116-97 and ASTM C1018-97. Acceptable products include, but are not limited:
1. Nycon Nylon Fibers.
2. Forta Nylo-Mono Nylon Fibers
3. Fibermesh Fibermix Stealth Polypropylene Fibers.
4. Grace Polypropylene Fibers
5. Forta Mighty-Mono Polypropylene Fibers

Synthetic fiber reinforcement shall be used in strict accordance with the manufacturer's recommendations. Dosage rate shall be as recommended by the manufacturer, but not less than 1 pound per cubic yard.

2.04 ACCESSORIES

A. Dissipating Curing Compound: Comply with ASTM C309-98a, Type 1, Class A or B (clear), except moisture loss not to exceed 0.40 kg/sq m. in 72 hours. Compound shall comply with EPA's VOC requirements. Apply at the manufacturer's written recommended application rate.

B. Sealer: Clear membrane-forming compound which will not yellow. Must be formulated for the intended application, either interior or exterior and applied per the manufacturer's written recommendations. Must comply with EPA's VOC requirements and be compatible with the curing compound used.

C. Penetrating Sealer: Acceptable products include, but are not limited to:
1. L&M Construction Chemicals - Aquapel Plus 40
2. ProSoCo - Saltguard WB
3. Huls America Inc. - Chem-Trete BSM 40
4. Master Builders Inc. - Masterseal SL 40
5. Lymtal International - Iso-Flex 618-50 WB
6. BASF - Enviroseal 40 or Hydrozo Silane 40
7. Tex-Cote - Rainstopper RS140

D. Expansion, Isolation, and Construction Joints:
1. Pre-formed Joint Filler: Non-impregnated type, closed cell resilient polyethylene foam, 1/2 inch thick unless otherwise noted. Meet or exceed requirements of ASTM D 1752, Sections 5.1 through 5.4, and ASTM D 5249, Type 2. Ceramar Flexible Foam Expansion Joint by W.R. Meadows or approved equal.
2. Joint Cap: Two piece vinyl device with upper 1/2 inch removable after curing period. Width corresponding to joint filler. Products by Greenstreak Plastic Products, Vinylex Corp., Vulcan Metal Products, or approved equal.
3. Joint Sealant: High performance, self leveling, elastomeric polyurethane sealant conforming to ASTM C-920. Sikaflex 1CSL or approved equal.

2.05 ADMIXTURES

A. Air Entrainment: ASTM C260-86.

B. Chemical Admixture: ASTM C494-86, Type A or D - water reducing, Type C or E - accelerating.

2.06 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete for the following characteristics:

- Compressive Strength at 28 days: 4000 psi.
- Min cementitous materials content 564 lbs./cu. yd.
- Max water-cementitous ratio 0.45, air content 6+1, -1.5%

C. Use accelerating admixtures in cold weather only when approved by Architect/Engineer. Use of admixtures will not relax cold weather placement requirements.

D. Use set-retarding admixtures during hot weather only when approved by Architect/Engineer.

E. Add air entraining agent to concrete mix for concrete work exposed to exterior.

F. Concrete mixes shall not contain any deleterious or other reactive aggregates or materials that can initiate and promote alkali silica reaction (ASR).

2.07 DETECTABLE WARNINGS

A. Detectable warning surfaces shall contrast visually with walking surfaces and be textured to provide slip resistance. The preferred color for a light background shall be brick red. The preferred color for a dark background shall be light granite. Color shall be integral with the detectable warning surface and shall not be painted or surface applied.

B. Detectable warning surface shall have truncated domes with a consistent base diameter ranging from 0.9 inches 1.4 inches. Truncated domes shall have a height of 0.2 inches and a top diameter ranging from 50 to 65 percent of the base diameter.

C. Truncated domes shall have a consistent spacing ranging from 1.6 inches to 2.4 inches measured center-to-center. Base-to-base spacing measured between the most adjacent domes shall be 0.65 inches minimum.

D. Detectable warning surfaces shall be of the type specified on the drawings:
   1. Type I – Pre-Manufactured Wet-Set Products
   2. Type II – Stamped, Color Dyed Concrete
   3. Type III – Precast Manufactured Clay and Concrete Pavers

E. Contractor shall submit detectable warning surface product data for review prior to construction.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade or granular base stabilized soil is ready to support paving and imposed loads.

B. Proof roll subgrade and correct any areas determined unacceptable to Testing Agency immediately prior to placement of concrete pavement.

C. Verify gradients and elevations of base are correct.

D. Beginning of installation means acceptance of existing conditions.

E. Proof roll prior to base placement.

3.02 REINFORCEMENT

A. Place reinforcement at mid-height of slabs-on-grade.

B. Interrupt reinforcement at expansion joints.

C. Place reinforcement to achieve slab and curb alignment as detailed.

D. Provide dowelled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement, per ODOT Item 451.

3.03 JOINTS

A. Location: Locate as shown on drawings. In absence of information on drawings, provide joints as specified below.

B. Control Joints: Created within 8 hours of concrete placement. Sawed typical, tooled where allowed by the Engineer.
   1. Slabs:
      a. Spacing (in feet) shall be between 2 to 2-1/2 times slab thickness (in inches) in both directions, i.e. 4-inch thick slab shall have joint spacing at 8 foot to 10 foot centers.
      b. Grid of control joints to be approximately square with longest side to be not longer than 1.5 times the shortest side, i.e. 4-foot wide walk shall have joint spacing at 4 feet to 6 feet maximum.
      c. Depth of Joint: 1/4 of slab thickness.
      d. Width of Joint: 1/8 inch.
   2. Curbs:
      a. Maximum 10 feet on center. Aligned with joints in adjacent vehicular paving and sidewalks.
      b. Depth of Joint: 1-1/2 inches minimum.
      c. Width of Joint: 1/8 inch.

C. Isolation Joints: Formed before concrete placement.
   1. Location in Slabs and Curbs: Provide where slabs and curbs abut vertical surfaces: at intersections of sidewalks, abrupt changes in slab width, walls, columns, pole bases, outside face or edge of curbs, and manholes, catch basins, or curb inlets.
   2. Joint: Provide 1/2 inch wide Pre-formed Joint Filler with removable 3/8 inch deep Joint Caps. Joint Cap shall be set to finish grade elevation. After concrete has set, Joint Cap shall be removed and filled with 3/8 inch of Joint Sealant. Clean joint surfaces free from dirt, dust, and other contaminants that may affect the bond of the joint sealant material. Install Joint Sealant per manufacturer's specifications
      a. Slabs: Provide Pre-formed Joint Filler to full depth of slab minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.
      b. Curbs: Provide Pre-formed Joint Filler to full depth of curb. Joint Filler material shall be cut to match contour of face of curb minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.

D. Expansion Joints: Formed before concrete placement. Provide when specifically shown on the drawings or when placing concrete during temperatures less than 40 degrees Fahrenheit.
   1. Location:
      a. Slabs: Space maximum of 25 feet on center.
      b. Curbs: Align with joints in pavement. In absence of concrete pavement, provide at intervals not exceeding 25 feet.
   2. Joint: Provide 1/2 inch wide Pre-formed Joint Filler with removable 3/8 inch deep Joint Caps. Joint Cap shall be set to finish grade elevation. After concrete has set, Joint Cap shall be removed and filled with 3/8 inch of Joint Sealant. Clean joint surfaces free from dirt, dust, and other contaminants that may affect the bond of the joint sealant material. Install Joint Sealant per manufacturer's specifications
      a. Slabs: Provide Pre-formed Joint Filler to full depth of slab minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.

b. Curbs: Provide Pre-formed Joint Filler to full depth of curb. Joint Filler material shall be cut to match contour of face of curb minus 3/8 inches to allow for installation of Joint Cap and Joint Sealant.

E. Construction Joints: Clean, formed joints shall be set at predetermined locations and/or when 30 minutes elapses between successive pours of concrete.
1. Slabs: Provide Pre-formed Joint Filler, Joint Cap, and Joint Sealant at predetermined location. Joint shall be similar to Isolation Joint specified previously.
2. Curbs: Provide Pre-formed Joint Filler, Joint Cap, and Joint Sealant at predetermined location. Joint shall be similar to Isolation Joint specified previously.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Hot Weather Placement: ACI 305.

C. Cold Weather Placement: ACI 306.

D. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

F. Excavate, shape and compact subgrade for suitable bearing surface. Remove unacceptable material. Remove all roots occurring within 12 inches of nearest concrete surface. Fill depressions with acceptable material and compact.

G. Place, shape, and compact aggregate base to required section and grade. Provide 4 inch base course unless indicated otherwise.

H. Provide suitable forms of metal, wood or as approved to contain concrete to indicated line, grade and shape until set. Provide face forms for curb and other sections free of defects and conforming to indicated shapes. Provide side forms to full depth of concrete. Use approved flexible forms or curved forms of proper radius on curves having a radius of 150 feet or less.

I. Coat all forms with form treating material prior to placing concrete to prevent concrete damage during form removal.

J. Concrete mixing: ACI 301, Chapter 7, ready-mixed unless permission is given to site mix.

K. Place control, isolation, and expansion joints as indicated on Drawings and as specified previously.

L. Immediately before concrete placement, thoroughly wet all moisture absorbing material that will be in contact with the concrete. Standing water not permitted.

M. Place concrete in forms without segregation. Vibrate or hand tamp to remove voids. Strike off concrete and float smooth.

N. Do not place concrete on frozen ground.

O. Finish concrete as specified.

P. Place backfill using required material as soon as possible without damaging concrete.

Q. Repair or remove and replace damaged concrete as directed. Conform to ACI 301, Chapter 9.

R. Curing:
1. ACI 301, Chapter 12. Use waterproof sheet materials or liquid membrane.
2. Surfaces which are to receive penetrating sealer are to be moist-cured without the use of a curing compound.
3. Dissipating curing compound may be used, if completely removed prior to application of penetrating sealer.

S. Place expansion joints as indicated on Drawings. In addition, place where concrete surrounds or adjoins any existing fixed objects such as fire hydrants, columns, building foundations, and other rigid structures.

T. Maximum allowable deviation of formed edges from indicated location: 1/2 inch. Maximum allowable deviation of surface: 1/8 inch when checked with a 10 foot straight edge. Remove to nearest joint and replace any walk or slab exceeding stated deviations.

U. Slope walks and slabs away from buildings as indicated but not less than 1/8 inch per foot. Maintain design drainage grades to avoid low spots trapping water.

V. After water sheen has disappeared, lightly brush surface to a uniform texture unless otherwise indicated or directed. Edge joints to provide a smooth border around each panel.

W. Appearance: Take special precautions in material sources, mixing, delivery, and placement of walks to insure uniform appearance and coloration throughout the entire walkway. Variations in coloration, texture, and finish of any given type of walkway will be unacceptable.

X. Do not remove forms for minimum of 12 hours after finishing.

3.05 FINISHING

A. Sidewalk Paving: Light broom, radiused and trowel joint edges.

B. Curbs and Gutters: Light broom.

C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.06 PENETRATING SEALER

A. Remove all dust, dirt, laitance, and other contaminants. Remove curing compound completely, if used.

B. Provide test patches as required to ensure compatibility and effectiveness.

C. Apply with spray or roller, at the manufacturer's written recommended coverage rate, to the following surfaces:
   1. Horizontal top surface of all concrete exposed to the weather.
   2. Vertical surfaces of columns, walls, curbs, etc. within 12 inches of a treated horizontal surface.

D. Entire application is to be in strict conformance with the manufacturer's written requirements.

3.07 DETECTABLE WARNINGS

A. Detectable warning surface shall extend the full width of travel of the curb ramp or landing. Warning surface shall extend a minimum of 24 inches in the direction of travel.

B. The detectable warning surface shall be located such that the edge of the detectable warning nearest the curb line is 6 inches from the face of curb.

C. Truncated domes shall be aligned in a square grid and must not be skewed diagonally in the direction of travel. Truncated domes shall be aligned in rows parallel and perpendicular to the direction of travel.

D. The detectable warning finish surface shall be uniformly profiled to match the adjacent pavement surfaces without lips or obstructions.

E. Type I and Type II Detectable warning surfaces shall be installed in accordance with the manufacturer's specifications.

F. Type III Precast Manufactured Clay and Concrete pavers shall be installed per the manufacturer's specifications or as follows:
   1. Pavers shall be laid on a 4 inch thick unreinforced concrete base and set into a 1/2 inch thick bed of freshly poured latex or epoxy modified cement mortar.
   2. Pavers (excluding dome surface) shall be flush with the surrounding concrete.
   3. Joints between pavers and adjacent concrete shall be mortared flush and smooth with the adjacent surface and shall not exceed 1/4 inch in width.
   4. Joint spacing between pavers shall be between 1/16 to 5/32 inches.
   5. Joints between pavers shall be sand filled. Sand shall be a well graded, washed, non-plastic angular material free from foreign matter. Maximum particle size shall be no larger than the joint spacing.
   6. Pavers shall be crack-free and consist of full, completely formed domes.
   7. A 6 inch concrete edge restraint shall be provided around the full perimeter of the pavers. Concrete shall be cast-in-place, 3000 psi concrete.
   8. Pavers shall be protected during construction to avoid damage. Paver surfaces shall be kept clean of cement.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

A. Immediately after placement, protect concrete under provisions of Division 1 from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 33 11 00
WATER DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide new water lines from the existing water main to points shown on the plans. This includes, but is not limited to the following:
   1. Piping and fittings
   2. Fire hydrants
   3. Curb boxes and valves
   4. Post indicating valves, standard and electrically supervised
   5. Post type siamese
   6. Tapping sleeves and valves
   7. Meter pit and piping
   8. Flushing and testing
   9. Sterilization
   10. All labor, equipment, devices, materials and performing all operations necessary in connection with the combined water system as herein specified and shown, indicated or noted on the drawings and subject to the terms and conditions of the contract.

1.02 RELATED SECTIONS

A. Section 03 30 00, "Cast-in-Place Concrete"

B. Section 31 23 33, "Piped Utilities - Basic Methods"

1.03 REFERENCES

A. American Society of Testing and Materials (ASTM).
   - A377 Specification for Gray Iron and Ductile Iron Pressure Pipe.
   - A47 Specification for Ferritic Malleable Iron Castings.
   - A53 Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc coated welded and seamless.
   - D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 40, 80 and 120.
   - D2774 Underground Installation of Thermoplastic Pressure Piping.
   - D2855 Making Solvent Cement Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
   - D2241 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   - D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe Systems.
   - D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
   - F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   - B32 Solder Metal.
   - B88 Seamless Copper Water Tube.

B. American Water Works Association (AWWA).
   - B300 Hypochlorites.
   - B301 Liquid Chlorine.
   - C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.

C110 Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids.
C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
C115 Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges.
C151 Ductile-Iron Pipe. Centrifugal Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
C153 Ductile-Iron Compact Fittings, 3 inches through 12 inches, for Water and Sewage Systems.
C502 Dry Barrel Fire Hydrants.
C508 Swing-Check Valves for Waterworks Service, 2 inch through 24 inch NPS.
C515 Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
C511 Reduced-Pressure Principle Backflow Prevention Assembly.
C600 Installation of Grey and Ductile Cast-Iron Water Mains and Appurtenances.
C651 Disinfecting Water Mains.
C700 Cold-Water Meters - Displacement Type, Bronze Main Case.
C701 Cold-Water Meters - Turbine Type, for Customer Service.
C702 Cold-Water Meters - Compound Type.
C703 Cold Water Meters - Fire Service Type.
C704 Cold-Water Meters - Propeller Type for Main Line Application.
C800 Underground Service Line Valves and Fittings.
C900 Poly(Vinyl Chloride) (PVC) Pressure Pipe 4 inches through 12 inches for water.
M23 PVC Pipe - Design and Installation.

C. American National Standards Institute (ANSI).

D. Underwriter's Laboratories (U.L.).

E. Factory Mutual (FM).

F. National Sanitation Foundation (NSF).

G. Plumbing and Drainage Institute (PDI).

H. National Fire Protection Association (NFPA).

I. Local Authority Standards / Delaware County Standards

1.04 REGULATOR REQUIREMENTS

A. Conform to applicable City code for materials and installation of the Work of this Section.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by Governing Authority.

1.05 CONCRETE WORK

A. Unless otherwise noted, all cast-in-place concrete shall be by the General Trades Contractor.

B. Unless otherwise noted, all concrete material and installation shall be as required in Division 3 of the Specifications.

1.06 SUBMITTALS

A. Submit under provisions of Division 1.

B. Submit product data, shop drawings, catalog cuts, etc., for pipe, fire hydrants, siamese, detector checks, meters, fittings, valves and accessories.

C. Certification from the Contractor stating that hydrostatic tests have been conducted in accordance with Specifications and in the presence of the Project Manager Engineer / Inspector and that the completed pipeline is acceptable in accordance with criteria set forth in Specifications for leakage.

D. Certification from the Contractor stating that pipe lines constructed have been disinfected as specified and are safe for conveying potable water.

E. Sequence of work in accordance with this Section and Division 1.

1.07 QUALITY ASSURANCE

A. Conform to applicable governing code for materials and installation of the work of this Section. In the event of a conflict between the drawings and the code, the code shall govern. No extra charges will be allowed for any changes necessary for code compliance.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE (PIPE SIZE 3 INCHES AND LARGER)

A. Pipe shall conform to ANSI/AWWA C151/A21.51, Class 53, push-on type (buried piping), or to ANSI/AWWA C115/A21.15, flanged type (exposed piping - water vaults, meter pits, etc.). Pipe shall have cement mortar lining per ANSI/AWWA C104/A21.4 inside and asphaltic coating per ANSI/AWWA C151/A21.51 outside.

B. Fittings shall be ductile iron per ANSI/AWWA C110/A21.10. Fittings shall have cement mortar lining per ANSI/AWWA C104/A21.4 inside and asphaltic coating per ANSI/AWWA C110/A21.10 outside. Fittings 16 inches and smaller may be manufactured according to ANSI/AWWA C153/A21.53. Pressure rating shall be 350 psi minimum.

C. Joints for exterior buried piping shall be mechanical joint type for fittings and push-on type for pipe, rubber ring gasket type conforming to ANSI/AWWA C111/A21.11.
1. "Tyton Joint Pipe" as manufactured by U.S. Pipe Co.
2. "Super Bell-Tite Joint Pipe" as manufactured by Clow Co.

D. Joints for exposed piping (meter pits, water vaults, etc.) shall be flanged joints conforming to ANSI/AWWA C115/A21.15 and to ANSI B16.1, 125 lb. template.

E. All piping and fittings shall be certified by the NSF for use in potable water systems.

2.02 POLYVINYL CHLORIDE (PVC) PIPE 4°INCHES TO 12°INCHES SIZE

A. Pipe 4 inches to 12 inches shall conform to AWWA C900, Class 200, maximum DR of 14, with elastomeric-gasket type joints.

B. Fittings shall be cast iron short body style ANSI/AWWA C153/A21.53 / full-body style ANSI/AWWA C110/A21.10 with Mechanical-Joint Ends and plain rubber ring gasket ANSI/AWWA C111/A21.11.

C. All piping and fittings shall be certified by the NSF for use in potable water systems.

2.03 POLYVINYL CHLORIDE (PVC) PIPE LESS THAN 4°INCHES SIZE

A. Pipe less than 4 inches size shall conform to ASTM D1785 Schedule 40.

B. Couplings and fittings shall be PVC Schedule 40.

C. Joints shall be solvent cement type.

D. All piping and fittings shall be certified by the NSF for use in potable water systems.

2.04 SEAMLESS COPPER WATER TUBING (LESS THAN 3 INCHES SIZE)

A. Seamless copper water tubing shall be Type "K" soft temper (buried piping) or Type "L" hard drawn (exposed piping - pits, vaults, etc.), conforming to ASTM B88 with solder (exposed piping) or brazed (buried piping) joints.

B. Joints shall be 150 psi wrought copper socket solder (ANSI/ASTM B16.22) or brazed (ANSI B31.1) joints.

C. Solder shall be 95/5 tin-antimony (ASTM B32), lead-free.
1. "Silvabrite 100" as manufactured by Engelhard.
2. "Bridgit" as manufactured by J.W. Harris Co.

D. Copper Brazing Alloys: Silver/Phosphorous or Silver/Zinc alloys having a melting point greater than 1,000 degrees F. (ANSI B31.1)
1. Sil-Fos filler as manufactured by Handy Harmon.
2. Aircosil filler as manufactured by Airco Welding Products.

E. Copper/phosphorous or silver/zinc alloys having a melting point greater than 1,350 degrees F.
1. "Stay-Silv 0" as manufactured by J.W. Harris.
2. "FOS-Flo 7" as manufactured by Handy Harmon.

F. Fittings shall be of the recessed solder joint type (exposed) or brazed (buried) of either wrought copper or cast brass.

G. Flux shall be non-corrosive.

H. All piping and fittings shall be certified by the NSF for use in potable water systems.

I. No alloys containing lead shall be used for brazing or soldering. Contractor shall certify that solder or brazing used for entire new piping system is lead-free.

2.05 GALVANIZED CARBON STEEL PIPE (LESS THAN 4 INCHES SIZE)

A. Galvanized carbon steel pipe shall be Schedule 40 with screwed ends conforming to ASTM A53.

B. Fittings shall be malleable iron screwed end fittings, conforming to ASTM A47 and A338 with minimum pressure rating of 150 psi.

C. All piping and fittings shall be certified by NSF for use in potable water systems.

2.06 VALVES

A. Gate Valves: 3 Inches and Larger: Resilient wedge, iron body, non-rising stem, UL/FM listed, mechanical joint or flanged ends (flanged ends in valve pits only), working pressure rating 150 psi minimum, renewable bronze yoke bushings, and bronze seat rings; shall conform to AWWA C515. Square operating nut, counter clockwise to open (buried piping) or handwheel operator (valve pits).
1. American Darling, Clow, Mueller.

B. Gate Valves: Smaller than 3 Inches: Class 150, solid wedge, non-rising stem (buried piping) or inside screw and rising stem (valve pits), flanged or threaded end connections with a union on one side of the valve. Square operating nut, counter clockwise to open (buried piping) or handwheel operator (valve pits).

C. Indicator Valves:
1. Factory assembled UL listed and FM approved PIV, rated at 175 psi minimum, with inside screw grade post indicator-operator. Turn operator counterclockwise to open unless otherwise directed by local fire department. Provide post with a fail-safe feature in case of breaking off above grade to keep valve intact and to move to open position. Furnish worm gear type operator with permanently oil lubricated watertight gear case complete with handle. Bituminous coat all surfaces below grade not less than 12 mils thick. Finish fill, prime and factory finish all above grade surfaces with a multiple coat of high-gloss, weather-resistant, red enamel.
2. Mueller, Co. Model No. A20806, Kennedy Model No. 2945A and Clow Model No. 2945A.
3. Electrically supervised. PIV complete with integral tamper switch. Division 16 Contractor to provide control/signal wiring.

D. Swing Check Valves:
1. UL/FM listed, 175# WWP cast iron body; brass moving parts including clapper valve seat and pivot shaft, Buna-N "O" ring, flanged connections.
   a. Viking Model C2, Grinnell, Reliable, or Central.

2.07 VALVE BOXES

A. Valve boxes shall be cast iron Buffalo type and shall have screw type extension adjustment with flared base. Boxes shall be of sufficient length so that at least 6 inches of adjustment remains when installed to finished grade. The word "water" shall be cast on the cover.
   1. Sigma Corporation, East Jordan Iron Works, Bingham and Taylor, or approved equal.

2.08 TAPPING SLEEVES AND VALVES

A. Materials and operations shall conform to AWWA C515. Valves shall have one (1) end flanged and other end mechanical joint type with flange for bolting to tapping machine. Sleeves shall be 2-piece cast iron, with mechanical joint ends. Tapping sleeves furnished complete with joint accessories. Valve and sleeve assembly shall be capable of withstanding at least 125 psi work pressure.
   1. Clow Co. Model F5093 valve and F5205 sleeve or approved equal.

2.09 DETECTOR CHECK

A. UL/FM listed, 175# WWP, cast iron body, two (2) tapped bases for meter and bypass trimming, hard rubber bushings, bronze clapper with full face rubber gasket, neoprene discs, flanged connections. Bronze hinge pins, weights and seat.

B. Full meter bypass including magnetic drive disc meter with bronze case, globe and check valves.

C. Hersey Model DC, Grinnell, Reliable, Central, Automatic Sprinkler, or Viking.

2.10 FIRE HYDRANT

A. Provide fire hydrants per Orange Township Fire Department and Delco Water Department standards. If no such standards exist, the following may be used:
   1. Dry barrel type, low profile hydrant shall comply with local government requirements and shall be UL listed and FM approved. Hydrant shall have 5 1/4 inch valve opening and two (2) hose outlets and one (1) 4 1/2 inch steamer nozzle complete with non-binding caps and cap chains. Hose outlet threads shall be local fire department.
   2. Exterior surface shall be filled, primed, and finished with a multiple coat, high-gloss, weather-resistant red enamel. All surfaces below grade shall receive a coating of bitumen not less than 12 mils thick. Care shall be exercised not to plug barrel drainage outlet applicable provisions of AWWA C502.
   3. Mueller Co., Clow, East Jordan Iron Works.

2.11 SIAMESE CONNECTION

A. Polished brass angle body, post type, two-way 2 1/2 x 2 1/2 x 6 with clappers, 18 inch long polished brass cover sleeve, polished brass I.D. base plate labeled STANDPIPE, plugs and chains with threads to match Local Fire Department.
   1. Potter-Roemer, Inc. Fig. 5760 series, Croker-Standard, Elkhart Brass, Guardian, or W.D. Allen.

2.12 DISINFECTION MATERIALS

A. Liquid chlorine shall conform to AWWA B301. Calcium and sodium hypochlorite shall conform to AWWA B300.

2.13 PRESSURE REDUCING VALVES

A. 2 Inch and Smaller: All bronze body, stainless steel renewable seats, reinforced Buna-N diaphragm and valve disc (ASSE 1003), dead end service type.

B. 3 Inch and Larger: Flanged cast iron body dead end service type with bypass tappings, renewable stainless-steel stem and seats, replaceable diaphragm and housing, rubber disc, globe valve, 250 psi WWP with internal parts to be epoxy coated.

2.14 WATER METER

A. Furnish meter with construction and readout approved by (or furnished by) Utility Company / authority having jurisdiction.

B. Turbine type with bronze case, flanged ends, polypropylene rotor, ceramic magnets, stainless steel shaft and bolts, 150 psi W.P. register readout in cubic feet per minute.
1. Hersey Model MHR, Badger or approved equal.

C. Remote Readout Register: Hersey Gen-a-reader II measuring in cubic feet per minute.
1. Hersey, Badger or approved equal.

2.15 METER PIT

A. Furnish meter pits as per Delco Standard Drawing No. D-10.

B. Furnish a precast concrete meter pit with sump drain, access and construction as indicated on the Drawings.
1. E.C. Babbert, Norwalk Concrete Ind., or Mack Ind.

C. Manhole Covers

2.16 CURB OR SERVICE STOP

A. Ground key, round way, inverted key type; shall be made of bronze conforming to ASTM B61/B62 and rated 150 psi minimum. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stops indicating direction of flow.

2.17 BACKFLOW PREVENTERS

A. 175# SWP reduced pressure (ASSE 1013), bronze or cast iron body, with vents, inlet, outlet and valve test cocks, neoprene discs, Buna-N or plastic disc-stainless spring interior check and differential pressure relief valves, 32 degrees F or 145 degrees F meeting the requirements of the local water department.
1. 3/4 Inch to 10 Inches: Watts #909 with air gap air drain funnel. Refer to the Manufacturer's Catalogs for size of drain pipe required.

2.18 CORPORATION STOPS

A. Ground key type, made of bronze conforming to ASTM B61/B62 and suitable for the working pressure of the system. Ends shall be suitable for solder joint, or flared tube compression type joint.

Threaded ends of inlet and outlet of corporation stops shall conform to AWWA C800, coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.

2.19 YARD HYDRANT

A. Freezeless/pollution-proof sanitary post type yard hydrant Woodford Model S3 with 1 inch female pipe thread inlet, 3/4 inch brass hose nozzle outlet, PVC drain reservoir and vacuum breaker. Supply line shall be 3/4 inch copper Type K per ASTM B88. Minimum depth of cover 4 feet, unless noted otherwise.

2.20 SPECIALTIES

A. Supervisory (Tamper) Switch:
   1. Weather-resistant, single-pole, double-throw switch, roller type switch actuator, spring-loaded plunger, tamper-proof cover (extra set of contacts).
      a. Potter-Roemer Fig. 6220

B. Pressure Gauge:
   1. UL/FM listed, dial spring, brass case, 3 1/2 inches diameter, 1/4 inch NPT male connection, range: 0-300 psig.
      a. Reliable Model UA, Viking, Grinnell, Central, Star, or Automatic Sprinkler.

PART 3 EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS

A. Handling:
   1. Utmost care shall be exercised in transporting and handling of pipe, fittings, valves, etc., in order to avoid shock damage to pipe or protective coatings and linings. Pipe, fittings and accessories shall be loaded and unloaded by lifting with hoist or skidding in a manner that will avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. In the event that any part of the coating or lining is damaged, the repair shall be made by the Contractor to the satisfaction of the Engineer or the pipe shall be rejected.
   2. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench without blocking access to driveways, alleys, or public utility facilities.

3.02 PIPING INSTALLATION

A. Pipe buried in ground shall have firm bearing along entire length of undisturbed earth. Pipe on fill or loose soil shall be supported every 6 feet on brick or concrete piers and then firmly embedded in sand. Provide compacted clay bulkheads to prevent groundwater in sand from draining to building.

B. Pipe trenches shall be evenly graded.

C. Depth of bury shall not be less than 4 feet from finished grade to top of pipe barrel. Should there be an apparent significant discrepancy between the ground elevations shown on the drawing and those established in the Contractor's stakeout, the Engineer shall be notified at least ten (10) days ahead of the pipe laying operation. Pipe shall not be laid with depth of bury less than 4 feet without the approval of the Engineer.

D. Securely anchor each mechanical joint, tee, plug, caps and bends using pipe clamps, tie-rods or concrete thrust blocks conforming to the requirements of NFPA 24 and the authorities having jurisdiction.

E. All changes in direction shall be made with fittings or joint deflection not exceeding manufacturer's recommendations. Any transition from one (1) pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically called for on the drawings or unless approved by the Engineer.

F. Pipe cuttings and drilling, where necessary, shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type mechanical cutter. Cut sections of pipe shall be reamed or filed to remove all burrs.

G. Laying:
1. Each section of pipe shall be inspected for defects prior to being lowered into the trench. Defective, damaged or unsound pipe shall not be used.
2. Pipe trenching and bedding foundation shall be provided in accordance with Section 31 23 33, "Piped Utilities." Trenches shall be kept dry during bedding and laying operations. Pipe shall not be laid when the conditions of trench or weather are unsuitable.
3. All pipe shall be carefully lowered into the trench by crane or other method as approved by the Engineer.
4. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipelaying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the preceding pipe. During laying operations, no debris, tools, clothing, or other material shall be placed in the pipe. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substances can enter the pipe or fittings. As work progresses, the interior of the pipe shall be cleaned of any dirt and superfluous materials.

5. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. The manufacturer's recommendations as to limits of deflection of joints shall be strictly adhered to. Precautions shall be taken to prevent dirt from entering the joint space.
6. Joints on laid pipe shall not be covered until approved. Pipe, pipe fittings, or appurtenances found defective after installation shall be replaced at the Contractor's expense.

H. Locating:
1. Where location of water pipe is not clearly defined by dimensions of Drawings, water pipe shall not be laid horizontally closer than 10 feet from an active sanitary sewer line except where the bottom of the water pipe will be at least 18 inches above top of the sewer pipe.
2. Where water pipe will cross under active gravity flow sanitary sewer lines, sewer pipe for a distance of at least 10 feet on each side of crossing shall be fully encased in concrete 4 inches thick or shall be made of pressure pipe with no joint located within 3 feet horizontally of the crossing. Joints in sewer pipe closer horizontally of the crossing than 3 feet shall be encased in concrete.
3. Water lines in all cases shall cross above sewage force main or inverted siphons and shall not be less than 18 inches above the sewer main. Sewage force mains or inverted siphon shall be lowered in order to satisfy above requirements and also the minimum cover depth over water line of 4 feet.
4. Water lines shall not be laid in same trench with any gas line, fuel line or electric wiring.

I. Install utility warning tape 18 inches below finished grade.

J. Distribution System Installation.
1. PVC Pipe: Conform to manufacturer's recommendations and AWWA M23 and ASTM D2744.
2. Gate Valves: Install in accordance with AWWA C600 and manufacturer's recommendations.
3. Tapping Sleeves and Valves: The Contractor shall be approved by the authority having jurisdiction for tapping service connection. Install under pressure on lines shown. Valves and sleeves shall be installed in accordance with manufacturer's recommendations. Lines shall be drilled and valves installed using approved equipment as recommended by valve manufacturer. Outages to existing mains during installation, except where approved in cases of emergency, will not be permitted.
4. Valve Boxes: Install in accordance with AWWA C600 over all new below grade valves. Boxes shall be centered over the valves. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box or to the undisturbed trench face if less than 4 feet. A concrete collar shall be placed around each box top at finished grade. Collar shall be 18 inches diameter and 8 inches thick.

K. Thrust Blocks
1. Provide cast-in-place concrete thrust blocks where shown and of the size indicated. The base and thrust bearing sides of block shall be cast directly against undisturbed earth. Sides of thrust blocks not subject to thrust may be cast against forms. The area of bearing shall not be less than that indicated on the drawings. Blocking shall be placed so that the fitting joints will be accessible for repair.
2. Approved joint restraint systems may be used in lieu of thrust blocks.

L. Fire Hydrants
1. Install in accordance with AWWA C600, as applicable except at modified herein.
2. Operating nut shall not be more than 3 feet above the finished grade. Hydrants shall be set so that the bury line marked on the barrel is flush with finished grade. Set hydrants plumb and on a firm footing. Footers shall be provided prior to setting hydrant consisting of either cast-in-place slab or solid concrete block not less than 6 inches thick and 15 inches square. Thrust blocks or restraint rods shall be provided as shown after hydrant has been set in place.
3. Provision shall be taken to carry off drainage from each new hydrant. The area around the base of each new hydrant shall be excavated sufficiently to permit placement of approximately 1/3 cubic yard of 3/4 inch size clean crushed stone to a level several inches above drain opening. The stone shall be placed as shown and covered with roofing paper prior to backfilling to prevent clogging of drain pit.
4. Where ground water is encountered standing at levels above that of hydrants drains the Contractor shall immediately contact the inspector who shall notify the project engineer. Measures will be taken to remedy the situation as directed.
5. Each hydrant and branch line shall be thoroughly flushed, pressure tested and disinfected as specified after thrust blocks and concrete footings have been cured prior to any backfilling.

3.03 QUALITY CONTROL

3.03.1 HYDROSTATIC TESTS

A. General Requirements:
1. The Contractor shall provide all necessary water, equipment and instrumentation required for proper completion of the flushing and testing of piping systems. Source and quality of water, test procedures and disposal of water shall be approved by the Engineer.
2. All tests shall be made in the presence of the Local Authority's Inspector. Preliminary tests made by the Contractor without being observed by the Inspector will not be accepted. Notify the Engineer and the Inspector at least twenty-four (24) hours before any work is to be inspected or tested.
3. All defects in the piping systems shall be repaired and/or replaced and retested until acceptable to the Engineer. Repairs shall be made to the standard of quality specified for the entire system.
4. Sections of the system may be tested separately, however, any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested. Pressure tests shall be made between valves to demonstrate ability of valve to sustain pressure.
5. All piping systems shall be tested in accordance with these test methods in addition to any test required by local plumbing codes or building authorities.

B. Flushing: All piping systems shall be flushed with water to remove construction debris prior to testing. Water for flushing operations shall be paid by the Contractor at the rate set by the authority having jurisdiction.

C. Hydrostatic Testing:
1. Perform in accordance with AWWA C600 or NFPA 24. Any contradictions between these Specifications and AWWA C600 or NFPA 24, AWWA C600 or NFPA 24 shall govern. Local Code shall govern over these Specifications or AWWA C600 or NFPA 24.
2. All newly laid pipe, above ground or below ground, or any valved section thereof, shall be subjected to a hydrostatic pressure test as hereinafter tabulated. All piping, that will be considered inaccessible or impossible to repair after the completion of all work, shall be hydrostatically tested while still accessible. Examples of such piping are those near or under basins, lagoons, railroads, paved roads, concrete structures, and concrete foundations.
3. The Contractor shall backfill all pipe and provide all reaction backing before hydrostatic testing. It shall be the Contractor's responsibility to locate and repair any and all leaks that may develop. The Engineer may direct the Contractor to leave certain joints and connections uncovered until testing has been completed.
4. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two (2) days have elapsed.
5. Reaction backing shall be in accordance with the drawings.
6. Before applying the specified test pressure, all air shall be expelled from the pipe and the lines shall be thoroughly flushed. If hydrants or blow off valves are not available, taps at points of highest elevation shall be made before the test is made and plugs inserted after the air has been expelled.
7. Each valved section of the pipe shall be slowly filled with water at specified test pressure, based on the elevations of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall make arrangements for metering the amount of water used during the test.
8. The Contractor shall complete testing, backfilling, grading, and cleanup between valved sections as he advances. If the Contractor fails to comply with this provision, pipe laying will be stopped until cleanup is completed.
9. After the section of line to be tested has been filled with water, the specified test pressure shall be applied and maintained for a minimum period of six (6) consecutive hours and for such additional period necessary for the inspector to complete the inspection of the line under test. If defects are noted, repairs shall be made at no additional cost to the Owner and the test repeated until all parts of the line withstand test pressure.
10. Hydrostatic test pressure (gauge) shall be the greater of 1.5 times the working pressure at the point of testing or 150 psi for all pressure piping. Maximum permitted leakage based on 18 foot pipe length is 8 quarts per hour per 100 joints of 12 inches nominal diameter and correspondingly varied for other pressures and sizes of pipe as provided in the AWWA C600 Specification.
11. The pressure shall be maintained within a maximum variation of 5% during the entire leakage test. Leakage measurements shall not be started until the air has been expelled and a constant test pressure has been established.

3.03.2 DISINFECTION

A. Before acceptance of domestic operation, each unit of completed supply line and distribution system shall be disinfected as specified below or as prescribed by AWWA C651.

B. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine conforming to AWWA B301 or hypochlorite conforming to AWWA B300. The chlorine material shall provide a dosage of not less than 50 parts per million and shall be introduced into water lines in an approved manner. Treated water shall be retained in pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, retention time shall be at least twenty-four (24) hours and shall produce not less than 10 ppm of chlorine at extreme end of line at end of retention period. All valves on lines being disinfected shall be opened and closed several times during contact period. Lines shall then be flushed with clean water until residual chlorine is reduced to less than 1.0 ppm. Samples of water shall be taken from points in the system in sterilized containers for bacterial examination. Disinfecting shall be repeated until tests indicate absence of pollution for at least two (2) full days. System will not be accepted until satisfactory bacteriological results have been obtained.

END OF SECTION

SECTION 33 30 00
SANITARY SEWERAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary drainage piping, fittings, drop connections, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Manholes.

D. Permits, inspection fees, tap fees, etc.

E. On Site Package Sewage Disposal Systems.

F. Lift station, valve pit and force main as shown on Drawings. Complete with gate and check valves and accessories.

1.02 RELATED SECTIONS

A. Section 31 00 00, "Earthwork"

B. Section 31 23 33, "Piped Utilities - Basic Methods"

C. Section 03 30 00, "Cast-in-Place Concrete"

1.03 REFERENCES

A. ASTM 2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

B. ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. ASTM D3212 - Joints for drainage Sewer Plastics Pipes using Flexible Elastomeric Seals.

D. ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure Pipe.

E. ANSI/ASTM A74 - Cast Iron Soil Pipe and Fittings.

F. AWWA C106 - Cast Iron Pressure Pipe.

G. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

H. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

I. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

J. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable municipal code for materials and installation of the Work of this Section. In the event of a conflict between the drawings and the code, the code shall govern. No extra charges will be allowed for any changes necessary for code compliance.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by State and local authority.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating dimensions, and invert elevations of manholes and cleanouts.

C. Submit product data under provisions of Division 1.

D. Submit product data for pipe, manholes, castings, and pipe accessories.

E. Submit shop drawings indicating dimensions, layout of piping, layout of tanks, dimension of tanks, pump capacities and horsepower, and location and elevations of testing wells, manholes and cleanouts.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities. Provide location, size, and elevation of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Plastic Pipe: ANSI/ASTM D3034, SDR 35 Type PSM, polyvinyl chloride (PVC) material.

B. Plastic Pipe Joints: ASTM D3212, bell and spigot style, flexible elastomeric seals.

C. Clay Pipe 4 Inches-24 Inches: ASTM C-700, Vitrified Clay Pipe, Extra Strength.

D. Clay Pipe Joints: ASTM C-425.

E. Cast Iron Pressure Pipe: AWWA C-106, joints per AWWA C-111.

F. Cast Iron Soil Pipe: ANSI/ASTM A74. Building service lines only.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T," bends, elbows, cleanouts, reducers, traps, and other configurations required.

2.03 MANHOLES

A. Lid and Frame: Cast iron construction, removable lid, closed lid design; nominal lid and frame diameter as shown on plans.

B. Shaft Construction and Eccentric Cone Top Section: ASTM C478, O-ring joints per ASTM C443 reinforced precast concrete pipe sections, lipped male/female joints; cast ladder rungs into shaft sections at 16 inches, nominal shaft diameter of 48 inches. Cast-in-place concrete side walls may be used in place of precast construction. Cast-in-place side walls shall be 8 inches nominal thickness.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive sewer pipe Section. Precast base sections may be used in lieu of cast-in-place base.

D. Resilient connectors between precast manhole and pipes shall conform to ASTM C-923.

2.04 CLEANOUTS

A. Cleanouts shall be adjustable, vandal-proof with heavy cast iron top for exterior use.
1. Zurn Z-1400-VP as manufactured by Zurn Industries, Inc.
2. Jay R. Smith 4220-U, as manufactured by Jay R. Smith Manufacturing Co.

2.05 BEDDING MATERIAL

A. Type E as specified in Section 31 00 00, "Earthwork."

2.06 FILL MATERIAL

A. Type A, D, J or K as specified in Section 31 00 00, "Earthwork."

2.07 SANITARY FORCE MAIN

A. Pipe: PVC pressure pipe, Class 200, SDR (21), ASTM D2241.

B. Joints: Integral bell gasketed joints per ASTM D3139.

C. Fittings: Fittings shall be ductile iron per ANSI/AWWA C110/A21.10. Fittings shall have cement mortar lining per ANSI/AWWA C104/A21.4 inside and asphaltic coating per ANSI/AWWA C110/A21.10 outside. Fittings 16 inches and smaller may be manufactured according to ANSI/AWWA C153/A21.53. Pressure rating shall be 350 psi minimum.

2.08 SANITARY LIFT STATION

A. Pumps: The Contractor shall provide a duplex packaged quick removal wastewater pump station. Two (2) pumps shall be Homa Submersible Grinder Pump Model No. GRP117(u)/3 or equal with a 2 inch flanged discharge capable of connecting to 2 inch flanged Schedule 40 galvanized steel pipe. Operating point of the pumps shall be 88 gpm at 188 feet TDH. Pump motor shall be 14 HP, 3,450 rpm, single phase, 208 volt and non-overloading throughout operating range of impeller. Provide quick removal system including base elbow with flange, upper guide bracket and galvanized slide rails.

B. Operating Controls: Supply 3-mercury filled float switches complete with galvanized rod. Each pump control switch will consist of normally open mercury switches, encapsulated in epoxy resin. The float casing will be polypropylene. The switch cable will be type 50 neoprene jacket 3 #18 conductor, 41 strand, 300 volt insulation. The cable will be secured to the support rod with a polypropylene composition clamp with stainless steel bolts. Sufficient length cable shall be supplied to allow removal of entire mercury switch assembly from the sump without disconnecting any wiring. A mercury switch plate shall be provided for bolting to basin cover plate. There will be a 1 inch diameter threaded fitting on the underside for installation of a galvanized rod. There will be four (4) holes with electrical compression fittings through which the mercury switch cables will pass and be sealed gas tight.

C. Electrical Control Panel: Supply 1 – NEMA 4X stainless steel double dead front, duplex control panel suitable for outdoor unistrut mounting. Panel shall be completely factory wired and bench tested for satisfactory operation prior to shipment.
   1. Panel to contain in a single enclosure the following: two (2) fusible disconnect switches with lock out handles through the door of panel. Disconnect fuses sized for motor protection only; two (2) across-the-line magnetic starters with coil overload protection and low voltage protection in all phases. Separate, replaceable relay to alternate pumps on each cycle of operation. An additional replaceable relay shall be supplied to cut-in standby pump if lead pump fails; two (2) H-O-A selector switches and two (2) pump run lights mounted on the door, one (1) 208/110 volt control circuit transformer with dedicated primary and secondary fusing.
   2. Panel shall include audible and visual alarms for high water, and cut-in of lag pump. Audible alarm to be 3 inch bell mounted on exterior of panel with one (1) red alarm light mounted on top of panel with one alarm-silencing switch. Auxiliary dry contacts shall be provided for both alarm conditions for purposes of wiring to a remote monitoring or alarm panel. A separate 110 volt line shall be provided for the alarm circuits including an on/off power switch. Panel shall include a relay to start both pumps if one (1) or both of bottom switches fail. Supply wired and numbered terminal strip. Supply with the panel an electrical wiring schematic of the system clearly indicating all necessary external field wiring connections. A copy of the wiring diagram is to be submitted with shop drawings.
   3. Panel shall include two (2) watertight, dust tight run timers. One (1) run timer connected to each pump. Run timers shall have shatterproof lens and bezel and display to 1/100 hour. Run timers shall be UL listed. Run timer shall be wired to manufacturer's specifications. Provide wiring diagram with shop drawing submittal.
      a. Grassline Model No. FWZ-72.
      b. Approved equal.

4. Provide dust tight seven (7) day clock. Clock shall be UL listed. Wire in accordance with manufacturer's specifications and the control schedule shown on the drawings.

D. Basin, Valve Box and Cistern:
1. Concrete 6 foot dia. basin and valve box and cistern shall be watertight.
2. Structures shall be precast and constructed in accordance with Section 2.03 – Manholes.

E. Piping: The discharge piping from the pumps shall be 3 inches mounted in the main basin and extending through the wall of the valve box and joined by flanged connections to the piping, valves and fittings contained within the integral valve box. The individual pump discharge lines shall be joined within the valve box, a flexible link type seal with an integral sleeve shall be furnished to provide a gas and watertight seal. A drain with check valve is provided to prevent water from entering the valve box, yet allows water to drain back to the main basin. Fittings in the valve shall include a plug valve and a swing type check valve for each pump.

F. Check Valves and Gate Valves: Furnish two (2) 3 inch flanged check valves with outside lever and adjustable spring tension to insure valve closing before flow reversal, and two (2) 3 inch NRS gate valves.

G. Supervision: Equipment supplier to be present at time of start-up to check all components of system and to make certain equipment is functioning as specified. Supplier will also provide instruction to Owner's personnel as to the proper system operation and maintenance.

2.09 VENT PIPING

A. Pipe: PVC Pipe, Schedule 40 per ASTM D1785.

B. Fittings: Per ASTM D2466. Connect with solvent cement type per ASTM D2855-93.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Type A or Type D fill material.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling and compaction.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ANSI/ASTM D2321, and manufacturer's instructions. Seal joints watertight.

B. Install rigid pipe, fittings and accessories in accordance with ASTM C-12 and manufacturer's instructions.

C. Bed pipe with Type E material per standard detail on Drawings.

D. Lay pipe to slope gradient noted on Drawings.

E. Install bedding of Type E material at sides and over top of pipe per standard detail.

F. Place bedding in maximum 6 inch lifts, consolidating each lift.

G. Refer to Section 31 23 33, "Piped Utilities - Basic Methods," for backfill and compaction requirements. Do not displace or damage pipe when compacting.

H. Connect to building sewer outlet and municipal sewer system.

I. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and cleaned to obtain an even and close fitting joint.

J. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

K. Where existing pipe is to be extended, the same type of pipe shall be used unless otherwise specified or directed.

L. Only full lengths of pipe are to be used in the installation, except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

M. All pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

N. The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

O. At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

3.04 INSTALLATION - MANHOLES AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 INSTALLATION – LIFT STATIONS

A. For details of lift stations construction, see Drawings.

B. Prior to placing the pump into operation, the contractor shall flush all lines coming into the basin, and clean basin of all silt, construction debris, and extraneous matter.

C. A representative of the manufacturer shall be present at time of initial start-up to assist the contractor in assuring the installations proper and functioning in accordance with the specifications.

D. The initial start-up shall include but not be limited to, a check of voltage, actual amp draw of pump under operating conditions and proper cycling of pump. A written copy of start-up test is to be supplied to Owner upon completion.

3.06 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 1.

3.07 PROTECTION

A. Protect finished installation under provisions of Division 1.

B. Protect pipe and bedding from damage or displacement until backfilling operation in progress.

3.08 TESTING

A. Leakage Tests. Leakage through the joints of all sanitary sewer pipe shall not exceed the following allowable limits:

100 gallons per inch of tributary pipe diameter per twenty-four (24) hours per mile of length of the computed equivalent for shorter lengths and shorter periods of time. All sanitary sewers shall be tested.

1. Infiltration Test: This test is to be conducted when the height of ground water table is 2 feet or more above the elevation of the inside crown of pipe at the upstream limit of the section being tested.

The infiltration test shall be made by installing a weir or other measuring device approved by the Engineer in the lower end of the sewer section to be tested. The quantity of ground water infiltration into the sewer shall be measured and shall not exceed the allowable leakage.

2. Exfiltration Test: This test is to be conducted when the height of the ground water table is less than 2 feet above the elevation of the inside crown of pipe at the upstream limit of the section being tested.

   In general, a test section shall include the distance between two (2) successive manholes. Should the test section fail the exfiltration test, the entire system installed shall be tested, either manhole to manhole or as a whole as directed by the Engineer. The inlet end of the upstream and downstream manholes shall be closed with a watertight bulkhead and the sewer, along with the upstream manhole, shall be filled with water until the elevation of the water in the upstream manhole is 2 feet higher than the inside crown of the pipe in the section being tested, or 2 feet above the existing ground water in the trench, whichever is the higher elevation. The length of section to be tested may be filled and maintained full of water for a period of approximately twenty-four (24) hours prior to the start of the test. If the water level in the upper manhole has dropped during this twenty-four (24) hour period, the level shall be raised to the test elevation marked prior to the measurement of leakage. If the Contractor elects to test at any time during the twenty-four (24) hour period, the water shall be set at the test elevation mark and the test made.

   The exfiltration will be determined by measuring the volume of water that is required to be added to return the surface of the water in the upstream manhole to the test elevation mark. The test period shall be a minimum of one (1) hour duration from the start of the test.

   The Engineer, because of adjacent trench material consideration, may order that after the completion of the exfiltration test the test section of line shall be drained and the infiltration, under existing ground conditions, shall be measured within three (3) hours by means of a weir located in the downstream manhole.

   The allowable leakage is based on maximum difference in elevation of 8 feet between the level of water in the upper manhole and the invert of the bulkhead pipe at the downstream manhole. If the difference in elevation exceeds 8 feet, the allowable leakage shall be increased 5% for each 1 foot in excess of eight feet.

3. Air Test: In lieu of exfiltration tests required for pipe sizes 8 inches through 24 inches and subject to approval of the Engineer, the Contractor may request an air test for checking tightness of sanitary sewer pipe construction. Air test shall conform to ASTM F-1417. Selection sections or sections of pipe between manholes shall be tested. Manholes shall be tested by plugging connecting pipe and filling with water to 2 feet from the crown of the highest entering pipe. After the filled manhole has been allowed to stand for twenty-four (24) hours, no loss of water will be permitted in a four (4) hour period.

Air testing of pipes will be accomplished only by use of equipment that has been approved by the Engineer and in accordance with the following steps:

a. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
b. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig.
c. After an internal pressure of 4.0 psig is obtained, allow at least two (2) minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
d. When pressure decreases to 3.5 psig, start stop-watch. Determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Minimum permissible pressure holding time for runs of single pipe diameter and for systems of 4 inch, 6 inch, or 8 inch laterals in combination with trunk lines shall be as published in tables by the National Clay Pipe Institute.

In the event the allowable leakage limits are not met, the Contractor shall determine the location where excess water is entering or leaving the sewer. The sewer and/or manholes shall be repaired in a manner satisfactory to the Engineer and retested until the leakage is within the allowable limit.

The Contractor shall include, in the price bid per linear foot of sewer, the cost of all bulkheads, plugs, pipe stopper, pumps, compressors, water, weirs, labor, delays, and any other items of cost necessary for the performance and completion of the required leakage test and for the cost of any repairs of adjustments which may be necessary to make the project conform to the required allowable leakage limits.

All leakage tests shall be conducted under the supervision of the Engineer or his/her representative.

4. Manholes: Manholes shall be air tested per ASTM C-1244.

B. Deflection: Prior to final acceptance of completed thermoplastic sewer lines, the Contractor shall, at his/her expense, perform a pipe deflection test on all main line sanitary sewers.

All lines shall be measured for vertical ring deflection no sooner than thirty (30) days after completion of backfilling operations, provided in the judgment of the Engineer, sufficient settlement of the backfill has occurred. The Engineer shall be the sole judge as to when sufficient settlement has occurred.

The maximum limit of vertical deflection shall not exceed 5% of the base inside diameter of the pipe as presented in Appendix XI of ASTM D-3034.

The test shall be accomplished by manually pulling an approved "go, no-go" mandrel with nine (9) arms.

The Contractor shall be responsible to provide all equipment and labor, including mandrel, to perform and conduct the required test. The Contractor shall also be responsible to notify the Engineer at least forty-eight (48) hours in advance of the anticipated date of the testing for scheduling of personnel needed to monitor the testing operations.

In areas where deflections exceed the 5% limit, the Contractor, at no additional expense to the Owner, will correct the problem area(s) as directed by the Engineer by one of the following procedures:

1. Trench shall be re-excavated, the backfill and pipe removed and replaced in accordance with the original plans and specifications. If in the opinion of the Engineer or his/her representative the pipe has been damaged the pipe shall be replaced with new pipe and installed per the plans and specifications. The failed sections of pipe corrected by this method shall be retested in accordance with this section no sooner than thirty (30) days after the correction is made or otherwise directed by the Engineer.
2. The failed section(s) will be rerounded by means of an internal pneumatic vibratory compactor, performed by an approved company providing this service. Methods, types of equipment, and company to provide service shall be submitted in writing to the Engineer for approval at least five (5) working days in advance of performing this procedure. This method may only be used if approved by the Engineer and it is determined that the deflection has not exceeded 10% of the base inside diameter of the pipe, by pulling a nine (9) arm "go, no-go" mandrel having a diameter equal to 90% of the base inside diameter of the pipe.

After either Procedure 1 or 2 is completed, the repaired area(s) will be retested according to this section prior to final acceptance.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of building and site storm water drainage system to municipal sewers.

C. Catch basins, curb inlets, manholes, underdrains, and headwalls.

D. Rock channel protection.

E. Permits, inspection fees, tap fees, etc.

1.02 RELATED SECTIONS

A. Section 31 23 33, "Piped Utilities - Basic Methods"

B. Section 03 30 00, "Cast-in-Place Concrete"

C. Section 31 00 00, "Earthwork"

1.03 REFERENCES

A. ASTM A74-87: Specification for Cast Iron Soil Pipe and Fittings.

B. ANSI/ASTM C76-89: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

C. ANSI/ASTM C443-85: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

D. ASTM D1248-89: Polyethylene Plastics Molding and Extrusion Materials.

E. ASTM D2321-89: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

F. ASTM D-3034-89: Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

G. ASTM D3212-89: Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

H. ASTM F405-89: Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

I. ASTM F794: Standard Specification for Poly(Vinyl Chloride) (PVC), Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

J. Uni-Bell, Uni-B-9: Recommended Standard Performance Specifications for Poly(Vinyl Chloride) (PVC), Large Diameter Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

K. AASHTO M252: Standard Specification for Corrugated Polyethylene Drainage Tubing, 3 to 10 Inches Diameter.

L. AASHTO M 294: Standard Specification for Corrugated Polyethylene Pipe, 4 to 60 Inches Diameter.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable City code for materials and installation of the Work of this Section.

B. Contractor to obtain and pay for all required permits, tap fees, inspection fees, etc., as required by Governing Authority.

1.05 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating dimensions, and invert elevations of manholes and cleanouts.

C. Submit product data under provisions of Division 1.

D. Submit product data for pipe, manholes, castings, and pipe accessories.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 1.

B. Accurately record location of pipe runs, connections, catch basins, manholes, cleanouts, and invert elevations if different than shown on plans.

C. Identify and describe unexpected variations to subsoil condition or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Pipe Size: 12 Inches or Larger.
   1. Reinforced Concrete Pipe: ANSI/ASTM C76, Class III mesh reinforcement, inside nominal diameter as shown on plans, bell and spigot end joints, tongue and groove end joints.
   2. Concrete Pipe Joint Device: Flexible Plastic Gaskets: AASHTO M198, Type B, Mastic joint / ANSI/ASTM C443, rubber compression gasket joint
   3. Smooth Interior Corrugated Polyethylene Pipe and Fittings: AASHTO M 294 Type S.

4. Smooth Interior Ribbed Poly (Vinyl Chloride) (PVC) Gravity Sewer Pipe & Fittings: ASTM F794, Uni-Bell, Uni-B-9.

B. Pipe Size: Less than 12 inches.
1. Service weight cast iron soil pipe and fittings for sizes through 15 inches: Bell and spigot type conforming to ASTM A74.
2. Type PSM Poly (Vinyl Chloride) (PVC) sewer pipe and fittings ASTM D-3034, joints per ASTM D-3212.
3. Smooth Interior Corrugated Polyethylene Pipe and Fittings: AASHTO M 252 Type S.
4. Smooth Interior Ribbed Poly (Vinyl Chloride) (PVC) Gravity Sewer Pipe & Fittings: ASTM F794, Uni-Bell, Uni-B-9.

2.02 PIPE ACCESSORIES

A. Polyethylene Pipe:
1. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.
2. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe. Inside diameter tolerances shall be plus 3% minus 1.5%. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings produced by manufacturers other than the supplier of the pipe lengths shall not be permitted without the approval of the project engineer.
3. Couplings shall be corrugated to match the pipe corrugations and the width shall not be less than 1/2 the nominal diameter of the pipe. Split couplings shall be manufactured to engage an equal number of corrugations on each side of the pipe joint.
4. A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished upon request to the project engineer.

2.03 CATCH BASINS, CURB INLETS

A. Basin Lid and Frame: Cast iron construction, nominal lid and frame size as shown on plans manufactured by Neenah Foundry Co. or equal.

B. Shaft and Top Section: Reinforced precast concrete, lipped male/female joints; nominal dimensions as shown on plans. Cast-in-place, brick or block side walls may be used in place of precast construction. Brick or concrete block side walls shall be 8 inches nominal thickness. When brick or concrete block are used, the outside walls of the manhole shall be plastered with a 1/2 inch coat of lime cement mortar.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive concrete shaft sections, sleeved to receive storm sewer pipe sections. Precast base sections may be used in lieu of cast-in-place base.

2.04 MANHOLES

A. Lid and Frame: Cast iron construction, removable lid, open checkerboard grill 22 1/4 inches.

B. Shaft Construction and Eccentric Cone Top Section: Reinforced precast concrete pipe sections, lipped male/female joints; cast steel ladder rungs into shaft sections at 16 inches; nominal shaft diameter of 48 inches. Cast-in-place, brick or block side walls may be used in place of precast construction. Brick or concrete block side walls shall be 8 inches nominal thickness. When brick or concrete block are used, the outside walls of the manhole shall be plastered with a 1/2 inch coat of lime cement mortar.

C. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, "Cast-in-Place Concrete"; leveled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections. Precast base sections may be used in lieu of cast-in-place base.

2.05 HEAD WALLS

A. Size and type as shown on plans.

2.06 UNDER DRAINS

A. Filter Fabric: Mirafi Geotextile, 160N or equal.

B. Filter Aggregate: ODOT #8/Type H.

C. Tubing: Polyethylene tubing, ASTM F-405 / AASHTO M 252.

2.07 CLEANOUTS

A. Cleanouts shall be adjustable, vandal-proof with heavy duty cast iron top for exterior use.
   1. Zurn Z-1400-VP, as manufactured by Zurn Industries, Inc.
   2. Jay R. Smith 4220-U, as manufactured by Jay R. Smith Manufacturing Co.

2.08 ROCK CHANNEL PROTECTION

The material shall consist of sound durable rock broken concrete or stone. Reinforcing steel in broken concrete shall not protrude beyond the surface of the concrete. A filter shall be placed consisting of filter fabric or a 6 inches bed of No. 3 or 4 crushed gravel stone or slag. Filter fabric shall be placed with long dimension parallel to the flow and shall be laid loosely but without wrinkles.

This material shall be one (1) of four (4) types defined below:

Type A shall consist of sizes such that at least 85% of the total material by weight shall be larger than an 18 inch but less than a 30 inch square opening. At least 50% of material by weight shall be larger than a 24 inch square opening. The material smaller than an 18 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type B shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 12 inch but less than a 24 inch square opening. At least 50% of the total material by weight shall be larger than an 18 inch square opening. The material smaller than a 12 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type C shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 6 inch but less than an 18 inch square opening. At least 50% of the total material by weight shall be larger than a 12 inch square opening. The material smaller than a 6 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

Type D shall consist of sizes such that at least 85% of the total material by weight shall be larger than a 3 inch but less than a 12 inch square opening. At least 50% of the total material by weight shall be larger than a 6 inch square opening. The material smaller than a 3 inch square opening shall consist predominantly of rock spalls and rock fines and shall be free of soil.

2.09 TRENCH DRAINS

A. Lid and Frame: Cast iron construction nominal lid and frame size as shown on plans. Model No. Neenah R-4999-BX with Type "C" grate or East Jordan Iron Works V-7362.

2.10 AREA DRAINS

A. 12 inch square top drain, Dura-Coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for heavy duty cast iron loose slotted grate with suspended sediment bucket.
   1. ZURN Z-610, as manufactured by Zurn Industries, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Plans.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Type A or Type D fill material.

B. Remove large stones or other hard matter which could damage storm sewer or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories, in accordance with ANSI/ASTM C76, ASTM D2321, and manufacturer's instructions.

B. Bed sewer with Type E fill material per standard drawing provided on plans.

C. Lay pipe to slope gradients noted on Drawings.

D. Place bedding material in maximum 6 inch lifts, consolidating each lift.

E. Backfill and compact per the requirements of Section 31 23 33, "Piped Utilities - Basic Methods." Do not displace or damage pipe when compacting.

3.04 INSTALLATION - CATCH BASINS, MANHOLES, AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation, provide 6 inches of Type E fill material under base.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

E. Form invert channel in manhole to spring line of sewer.

3.05 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 1.

3.06 PROTECTION

A. Protect finished installation under provisions of Division 1.

3.07 DEFLECTION

A. Prior to final acceptance of completed thermoplastic sewer lines, the Contractor shall, at his/her expense, perform a pipe deflection test on all main line storm sewers.

All lines shall be measured for vertical ring deflection no sooner than thirty (30) days after completion of backfilling operations, provided in the judgment of the engineer, sufficient settlement of the backfill has occurred. The Engineer shall be the sole judge as to when sufficient settlement has occurred.

The maximum limit of vertical deflection shall not exceed 5% of the base inside diameter of the pipe as presented in Appendix XI of ASTM D-3034.

The test shall be accomplished by manually pulling an approved "go, no-go" mandrel with nine (9) arms.

The Contractor shall be responsible to provide all equipment and labor, including mandrel, to perform and conduct the required test. The Contractor shall also be responsible to notify the Engineer at least forty-eight (48) hours in advance of the anticipated date of the testing for scheduling of personnel needed to monitor the testing operations.

In areas where deflections exceed the 5% limit, the Contractor, at no additional expense to the Owner, will correct the problem area(s) as directed by the Engineer by one of the following procedures:

1. Trench shall be re-excavated, the backfill and pipe removed and replaced in accordance with the original plans and specifications. If in the opinion of the Engineer or his/her representative the pipe has been damaged the pipe shall be replaced with new pipe and installed per the plans and Specifications. The failed sections of pipe corrected by this method shall be retested in accordance with this section no sooner than thirty (30) days after the correction is made or otherwise directed by the Engineer.
2. The failed section(s) will be rerounded by means of an internal pneumatic vibratory compactor, performed by an approved company providing this service. Methods, types of equipment, and company to provide service shall be submitted in writing to the Engineer for approval at least five (5) working days in advance of performing this procedure. This method may only be used if approved by the Engineer and it is determined that the deflection has not exceeded 10% of the base inside diameter of the pipe, by pulling a nine (9) arm "go, no-go" mandrel having a diameter equal to 90% of the base inside diameter of the pipe.

After either Procedure 1 or 2 is completed, the repaired area(s) will be retested according to this section prior to final acceptance.

END OF SECTION

SECTION 33 51 00
NATURAL GAS DISTRIBUTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a new natural gas service line as shown on the drawings.

B. All underground piping shall be installed in accordance with the Gas Company Standards.

1.02 QUALITY ASSURANCE

A. Standards: American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), American Gas Association (AGA), and National Fire Protection Association (NFPA).

1.03 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Submit product data for pipe and pipe accessories.

C. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 UNDERGROUND GAS PIPING

A. Plastic to within 5 feet of meter set only / as shown on the drawings: Non-flammable, thermoplastic gas pressure pipe and fittings (ASTM D2513) with two (2) No. 12 TW single strand, single conductor, copper tracer and lead wires, together with plastic curb boxes and terminal blocks. Pipe and fittings must be approved by Gas Company.

B. Black carbon steel pipe, conforming to ASTM A120 or ASTM A53, buttwelded, electric resistance welded, or seamless, Schedule 40 in sizes through 10 inches.

C. Black carbon steel pipe shall be polyethylene sheathed, conforming to Federal Specification L-C-530 with heat shrunk sleeves for butt joints and manufacturer's standard tape wrapping for fittings.

D. Polyethylene sheathing shall be as manufactured by Sheath, Republic X-TRU-COAT.

2.02 FITTINGS

A. Black carbon steel buttweld fittings, conforming to ASTM A234 and ANSI B16.9, wall thickness to match pipe wall.

B. Forged steel, slip-on or weld neck flanges, conforming to ASTM A181, Grade 1 or 2, ANSI B16.1

2.03 LUBRICATED PLUG VALVES

A. 2 1/2 Inches and Larger: 200 lb. WOG, semi-steel body, flanged ends with TFE stem seal and seat, square stem, wrench-operated.
1. Homestead Fig. 612, Powell, or Nordstrom.

2.04 CURB STOPS

A. Plastic line curb stops of a type and manufacturer approved by Gas Company.

2.05 CURB BOX

A. Cast Iron: Two-piece screw extension type with lid labeled GAS.
1. Kennedy Model Fig. 123, Mueller, or Ford.

B. Plastic: With lid labeled "GAS." Type and manufacturer approved by Gas Company.

PART 3 EXECUTION

3.01 INSTALLATION

A. The gas line shall run horizontal or pitch upward in the direction of flow. Provide 2 feet minimum cover.

B. A minimum of 6 inches of clearance shall be provided between the gas line and any other underground utility line crossing or paralleling it, except for electric lines, in which case the minimum clearance shall be 12 inches.

C. Provide all welded assembly with welding work in accordance with ANSI B31.1 code for Pressure Piping, performed by welding operators certified by the National Weld Test Bureau, or the approved bureau or agency.

D. Remove all damaged polyethylene shielding and replace with heating shrinkable sleeves placed on freshly adhesive-primer coated surface.

E. Wrap tape onto fittings or joints with 50% overlap, in accordance with manufacturer's most stringent requirements or recommendations.

3.02 TESTING

A. Purge all gas piping according to recommendations of and under supervision of Gas Company.

B. Gas service line shall be tested with nitrogen to a pressure of 90 psig or 1 1/2 times the operating pressure, whichever is greater, for twenty-four (24) hours consecutively with no leakage.

C. All tests shall be performed before any piping is covered or concealed. Tests shall be witnessed by the Architect's Representative.

D. A written record of tests shall be submitted to the Architect.

3.03 VENTING

A. Install a curb box to act as a vent before rise to meter and regulator. Lid to be marked "VENT."

B. Sleeve and vent all piping installed under exterior pavements or penetrating the exterior wall underground below the floor slab.

3.04 CATHODIC PROTECTION

A. Provide cathodic protection per Gas Company Standards and specifications for magnesium anodes, anode size and spacing and attachment method.
   1. Loop lead wire around pipe.

B. Test stations shall be located in a plastic curb box and conform to Gas Company Standards.
   1. Loop lead wire around pipe. Lead wires to consist of two (2) single strand, single conductor, No. 12 copper wires extending from pipe connection to terminal block at grade in curb box.
   2. Provide a minimum of two (2) test stations with maximum spacing of 300 feet.

END OF SECTION